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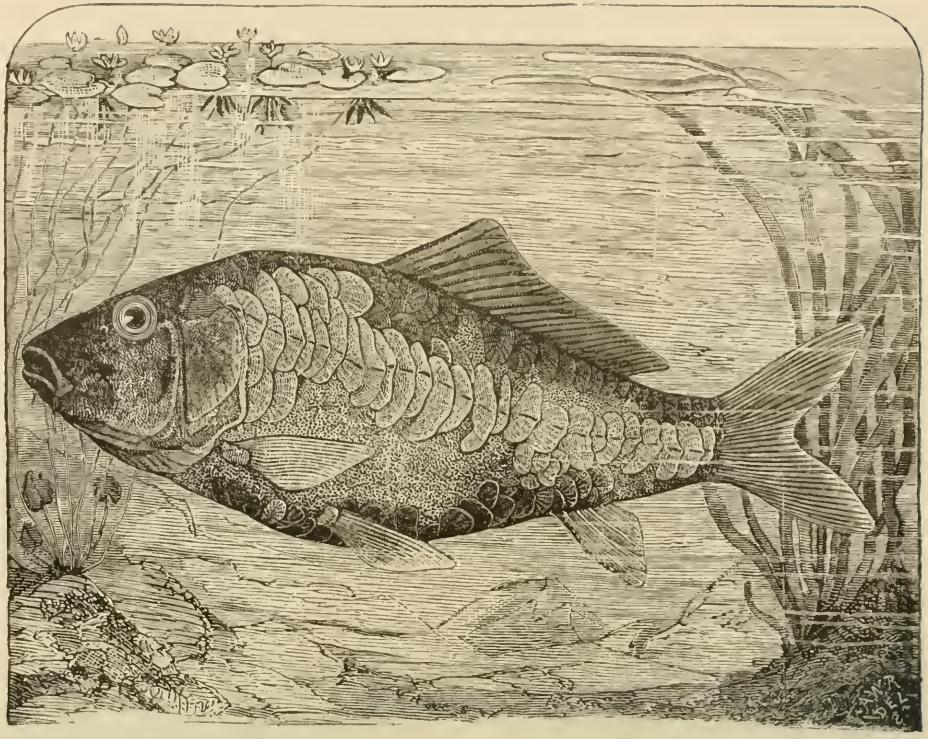

REPORT

AS THE CONDITION OF THIS VOLUME WOULD NOT PERMIT SEWING, IT WAS TREATED WITH A STRONG, DURABLE ADHESIVE ESPECIALLY APPLIED TO ASSURE HARD WEAR AND USE.

OF THE

ILLINOIS STATE FISH COMMISSION,

TO THE

GOVERNOR OF ILLINOIS.

SEPTEMBER 30, 1884.

SPRINGFIELD, ILL.:
H. W. ROKKER, STATE PRINTER AND BINDER
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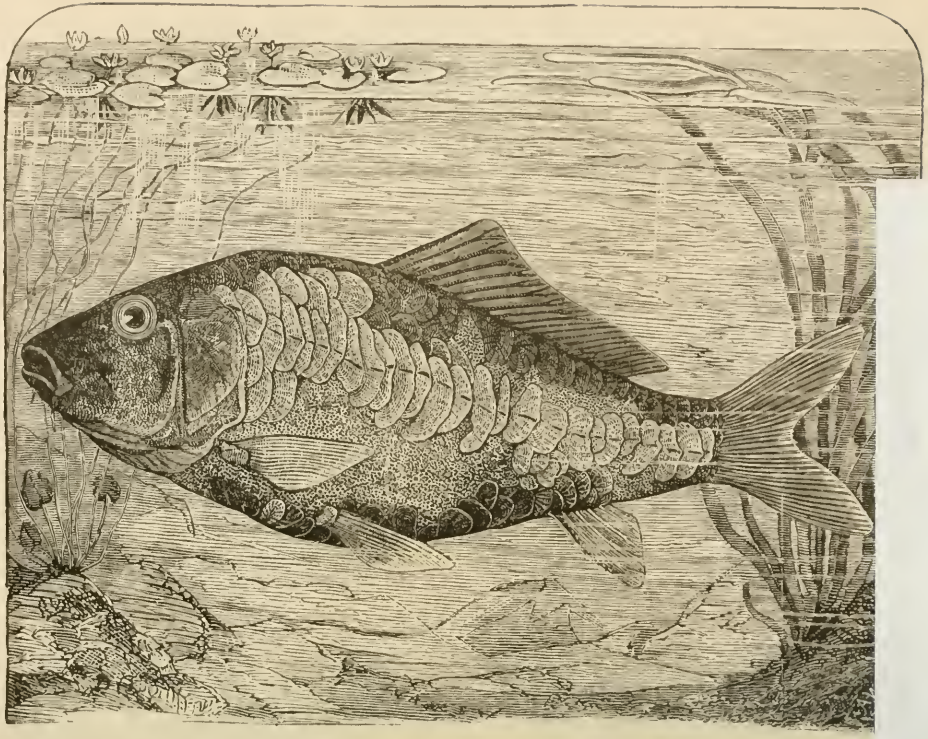

REPORT

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REPORT.

To His Excellency, GOVERNOR JOHN M. HAMILTON:

We beg leave to submit herewith our report for the year ending September 30th, 1884, as the Board of State Fish Commissioners.

The work of the Commission,—now fully operative, no longer an experiment—has developed throughout the State an increased interest in the subject of Fish protection and culture. Five years ago ponds for fish were rare in our State—to-day they number thousands, some of them on an extensive scale, but the greater portion forming a part of the general economy of the farm. These ponds are mainly used for the culture of the carp, and in almost every instance, where proper ponds have been built, and ordinary care taken of the fish, success has attended their efforts.

When the immense consumption of fish for food in this State is taken into consideration, some idea may be had of the drain on the natural resources of fish, and if no means had been used to protect and replace them to some extent, our waters must soon have been depleted. From the Mississippi and Illinois Rivers are taken annually ten million pounds of buffalo fish alone. In Lake Michigan the white fish have become scarce. During a convention at Milwaukee of the Fish Commissioners of the States bordering on the great lakes, a number of fishermen, who are actively engaged in fishing on Lake Michigan, were present, and asked that the Commissioners use their influence to obtain the passage of such laws as would protect the fish of the lakes, giving as a reason for their request the fact that the white fish particularly were fast disappearing from the lakes; that, while a few years ago a small boat with ordinary rig and two men could, by a day's work, fill the boat with fish, it was now a difficult matter with steam tug and outfit to obtain a few hundred pounds of white fish in a day. Now, with these facts in view, it seems but reasonable to conclude that, without better protective laws, and additional efforts on the part of the State in restocking our waters, and seeing that a free and unobstructed course is furnished them, the same results will be realized, viz.: extreme scarcity of the native fish in our principal rivers, streams and lakes.

NATIVE FISH.

The principal work of the Commission has been this, as in former seasons, the taking and distribution of native fish. Owing to the early rise and decline in the Mississippi River, from which we derive

the greater portion of our supply, later spawning fish did not get an opportunity to fully complete their deposit of spawn, cutting off to some extent the usual supply, but we found plenty of work to do, and thousands more of young fish than we could handle, although, for reasons given above, not so great a proportion of the fish we most desired, viz.: black bass. To illustrate the immense quantity of fish that are left in the low, flat places, levee pits, etc., from which we derive our supply, we will give one or two instances, samples of hundreds which occur during the season.

On August 14th Mr. Leonard Obert, living one and one-half miles northeast of La Grange, Mo., came on to our boat and informed us that on his farm there was quite a large pool of water, drying up very fast, which appeared to be full of fish, and that they would perish if not taken out very soon. We sent S. Kelley and gang No. 3 up with boats and seins. They took out from that one place 21 bushels of young fish, which would aggregate, if computed by usual estimate, 420,000 fish, but in point of fact would not number so many, as the fish had grown considerably, some being quite large size for age. They were taken to the boats and put into the Mississippi River near the Three Chutes. Owing to the extreme heat and distance they had to be carried, they could not be used for distribution.

On August 16th gang No. 1 took from a levee pit 8 miles below Hannibal in one haul of the seine 8 bushels of young fish, the greater proportion being young cat-fish. They were put over the levee into the river. So for sixty miles below Quincy exist along the levee these shallow holes made by excavating the earth from outside of levee to build or repair the levee. All of them, at some seasons of the year, become perfectly dry; all are usually filled in early spring with young fish.

Considerable fault has been found, at various times, with the Commission for taking the young fish from the Mississippi River for distribution throughout the State, it being claimed that we were robbing one section to benefit another. We desire to reiterate our former statement, that *in no instance has a fish ever been taken from the Mississippi River, or any other, for distribution or any other purpose, that would not have either died on account of drying up of water or have frozen out if left over winter.* On the contrary, the Mississippi River is richer by millions of fish of all varieties every season than it would be if your Commission did not rescue them. But a very small proportion of fish taken are sent out; only the better qualities are selected, the residue, as before stated the larger part, are put into the river, or adjacent deep water.

Our distribution has been as general and extended as possible. Wherever streams could be readily reached by railroad they have, in the main, received their proportion of fish, not always perhaps at most desirable points, but in every case where, in the opinion of the messenger, they would find a permanent home.

Our work has so increased and property accumulated, we found it necessary to have permanent headquarters, and with that end in view built a boat, hull 34 feet in length, 12 feet in width, covered with a good substantial cabin, giving us an office 9 feet square in

forward end, with storage room for our oars, seins and such valuable property as we have to care for.

We have also a covered storage boat in which are stored our tanks, smaller boats, cans, etc.

We have also found it necessary to have a quarter boat, in which one of our men lives, to protect our property, fish in live boxes, etc.

We have been caused a great deal of trouble by lawless persons who have destroyed everything they could belonging to the Commission. They burned our cabin in bottoms inside of Sny Levee two years ago. They cut up and destroyed one of our most valuable seines, destroying, at the same time, cans and other appurtenances in camp, and during the past season, broke into our office—then in rather insecure quarters,—and burned and destroyed a large portion of our papers, records and vouchers, entailing considerable loss on Commissioners direct, as in several instances it was impossible to procure other vouchers for those destroyed,—the men engaged in the work being a roving class as a rule, here to-day, to-morrow gone again. In view of these facts we have arranged good and secure quarters at a comparatively small expense. We have taken out policies on office boat for $600; on storage boat for $200.

The office work of the Commission has assumed large proportions, and is constantly increasing, which is, of course, but natural, considering the large number of applicants for carp, aside from the distribution of native fish. Some idea may be had of the volume of correspondence, when we state that during the months of October and November of last year, the letters and postal cards averaged over 900 per month, the carp distribution being then near at hand. This season it promises to be very much larger, as the number of applicants has materially increased. We have endeavored to give each letter attention, and give all information asked for promptly and as fully as possible.

We are using this season, for transporting young fish, a new tank device, that has enabled us to carry larger quantities of fish with same amount of water greater distances than formerly, and we have in view further improvements, that we hope will still further decrease mortality of the fish in transit, as well as materially reduce the expense.

POPULAR INTEREST.

We have stated that the interest in fish protection and culture has largely increased in the year past. The following facts will serve to prove the truth of our statement to some extent:

At Galesburg, Knox county, an inland town, Mr. George Brown has constructed on his farm, one mile east of the city, a pond or lake covering an area of six or seven acres, at an estimated cost of $15,000, built expressly for culture of native fish. The water is obtained by drain tile and springs, and is a handsome sheet of water. The banks are protected by sheet piling, the roadway around lake graveled, banks covered with a growth of grass. A miniature steamer has been placed on the lake. The citizens all seem interested, and, as they have reason to be, proud of the enterprise and liberality of their respected citizen. This lake has been stocked with black bass by the Commission.

At Danville, near the forks of the Vermilion River, has been built a dam, forming a beautiful lake in Ellsworth Park. Over this dam Mr. John Beard, who has a lease of the park, has placed a fishway in order that the fish may have a free course up the various streams during the proper season. Taken altogether, it is one of the best lakes in the State, and is an ornament to any city, and will in time afford enjoyment to the lovers of rod and line. This has also been partially stocked with fish, and additions will be made from time to time, until it is fully so. In company with Hon. E. R. E. Kimbrough and Hon. W. J. Calhoun, of Danville, who have been very active in their efforts to further the interests of the Commission, an examination of this lake and its tributaries was made by one of the Commissioners, and the water and surroundings found to be admirably adapted to the reception and propagation of the native fish.

At Springfield, the Springfield Fishing Club, an organized stock company for the protection of fish, etc., have obtained control of Clear Lake, a beautiful body of water situated about 6 miles east of the city. The company comprises over one hundred of the best citizens of Springfield. With their accustomed energy, they have improved the surroundings by cleaning up the grove adjoining, built a handsome boat-house, placed a steam yacht and a large number of row-boats upon the lake. The Commission has stocked the lake, and the company will see that the fish are fully protected.

At Decatur, the Decatur Fishing Club, an organization consisting of one hundred citizens, have built a fine lake, covering an area of about 5 acres, located about 2½ miles west of Decatur. The company have interested themselves in having this lake, as well as the Sangamon River, stocked with fish.

At Morrisonville, the Hon. J. L. D. Morrison has built a pond covering about 10 acres, now producing some very fine fish, croppies having been taken from it weighing nearly 2 pounds.

At Lanesville, Mr. F. K. Whittemore, of Springfield, has constructed a large pond on his farm, now stocked with native fish.

At Pekin, Hon. Thos. Cooper has built quite a large lake in a park adjoining the city, supplied by an artesian well. This, although the water has very abundant mineral properties, sulphur predominating, has proven to be very well adapted to fish, both native and carp.

About one mile east of Pekin is Bailey's Lake. This lake deserves especial mention, as there are but few, if any, others in the State so peculiarly located. It has neither inlet nor outlet, is fed by springs, covers an area of about 200 acres, almost surrounded by hills, subject to neither overflow nor backwater. This lake contains perch and sunfish in abundance, but neither bass nor pickerel. There is now a movement on foot to purchase the lake and land surrounding it by a stock company, when it will be improved, stocked with fine fish, and made a resort.

So all over the State clubs are organizing, companies forming, lakes being purchased, leased or built, and efforts made to better protect the fish interests.

CONCERNING DISTRIBUTION.

In order that we might make our distribution as general as possible, and to obtain such information as would enable us to accomplish this, we sent a circular letter to each member of the 33d General Assembly, a copy of which letter we append herewith:

QUINCY, ILL., July 20th, 1884.

DEAR SIR: We are now taking young native fish for distribution, and desire to make the distribution as general as means at our disposal will permit. We are endeavoring to induce all of the railroad managements to carry our tanks in baggage cars free, so as to materially reduce the expense incidental. A number have consented to do so, and we hope the larger proportion will.

Most of the streams were partly stocked last season, but our territory is large, and time will not permit the Commissioners to make a personal inspection of the streams. As a consequence the distribution is not as complete as it should be when the disposition of fish has to be left to a great extent to the messengers in charge of fish.

We have presumed to ask your assistance in giving us information regarding the waters of your county, what and where they are, whether the streams are obstructed by dams or not; if so, how many and where located; whether the water gets high enough during the season to cover dams, and allow fish to run up toward head waters.

We desire to give proper attention to every part of the State, and when no dams obstruct the streams, planting fish in any part will in time people the whole of it if protected, but when dams are used, various points of such streams will have to be planted.

Our carp distribution will take place in October or November, or at such time as the United States Fish Commission send us the fish, and we would be pleased to have you recommend any of your constituents who may desire to undertake their culture. So far, carp culture in this State has been attended with the most favorable results, many persons reporting ponds full of young carp, and the old fish weighing from 5 to 10 pounds. If convenient, favor us with such information as you may have, as early as possible, and it will greatly aid us. Yours truly,

A large number of those addressed sent us descriptions of streams, etc., in their counties, suitable for stocking with fish, and designated points of delivery, and parties to whom we could consign them. We have by this means been enabled to make our distribution more effectual than would have been the case had we been compelled to rely entirely upon the information and judgment of our messengers.

Our transportation facilities, thanks to the railroads, have been very good. Upon request of the Commissioners, the following named railroad companies have given us an order to carry our tanks in the baggage car. The following is a copy of the order, which is the the same as used by the United States Fish Commission, and to whom we are indebted for the form:

"*Chicago, Burlington and Quincy Railroad.*

NOTICE.

Upon presentation of this notice, duly countersigned by N. K. Fairbank, President Illinois State Fish Commission, conductors and baggage masters will transport free, until January 1, 1885, cans of young fish in baggage cars of passenger trains, and return empty cans, checking them to destination of messengers holding first-class tickets and accompanying cans.

Baggage masters will also render every assistance desired by messengers in charge of fish, and allow them access to the baggage cars for the purpose of giving the fish proper attention.

Conductors may stop trains at any stream to leave messengers and cans, where it can be done without in any way endangering their train or connections.

[Signed] HENRY B. STONE,

General Superintendent.

Countersigned]

N. K. FAIRBANK,

President State Fish Commission.

The above is substantially a copy of the order given us by the following named railroads, with perhaps some slight variations in a few instances:

List of Railroads Giving Permits.

Chicago, Burlington and Quincy R. R. Co.
Ohio and Mississippi R. R. Co.
Chicago and Alton R. R. Co.
Indianapolis and St. Louis R. R. Co.
Chicago, Rock Island and Pacific R. R. Co.
Louisville and Nashville R. R. Co.
Toledo, Cincinnati and St. Louis R. R. Co.
Illinois Central R. R. Co.
Lake Erie and Western R. R. Co.
Wabash, St. Louis and Pacific R. R. Co.
Chicago and Northwestern R. R. Co.

Of the results of our distribution of previous years, we have but to say that the good accomplished must be manifest to every one who takes an interest in such matters.

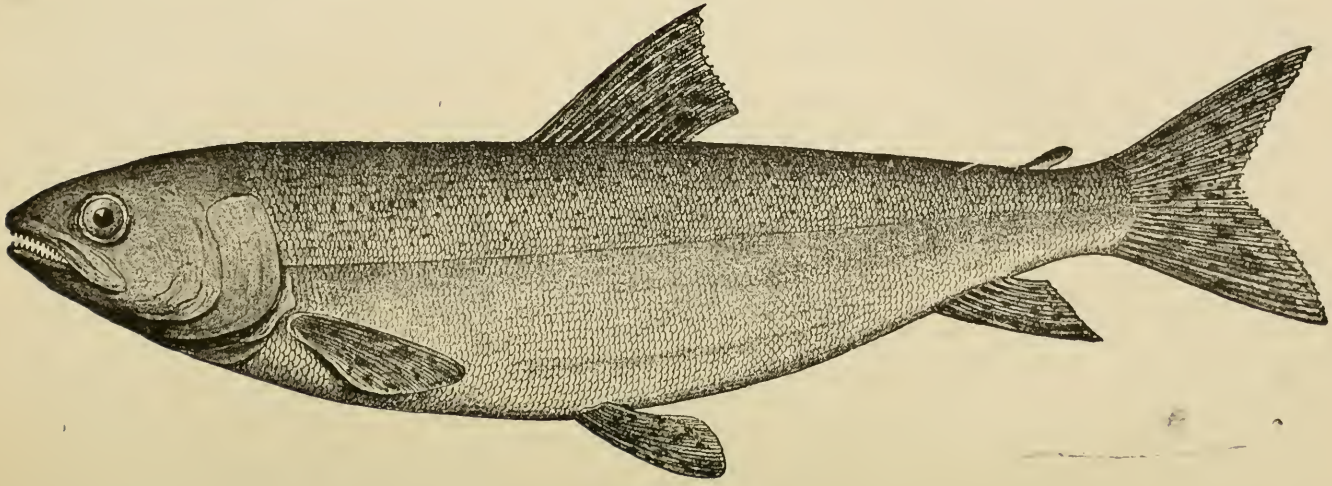
Along the Mississippi River, early this spring, as soon as ice had moved, pickerel from one to two years of age were moving up the stream, as is their habit, by the thousands. At the water-works well, at Quincy, a rocky prominence extending some feet out into the river, a great many were caught with dip-nets, by the Water Works Company, for stocking their reservoir. This circumstance, of itself, would amount to nothing, but for the fact that for a great number of years pike and pickerel have been practically extinct, and that until the river and its tributaries were stocked with pickerel obtained from the lakes, such an occurrence as just mentioned was unknown.

Beside this, the lakes and sloughs tributary to the river are filling up with the "Ringed Perch," a specie of fish rarely caught here until introduced by the Commission from the lakes.

Hon. Don Morrison received a letter from a friend at Carlyle, on Okaw River, saying that hundreds of young pickerel (found to be wall-eyed pike) were caught this spring while trying to get over the dam, and that they were comparatively new to that region.

Mr. F. Wood, Secretary of Decatur Fishing Club, writes us that they had caught a number of fine wall-eyed pike in the Sangamon River, near Decatur, last season, the first caught there for years. We believe that these and others reported from various points are the product of our planting some four years ago.

In October, the Mississippi River, contrary to its usual custom, swelled sufficiently to overflow its banks and released a large majority of the young fish confined in the holes and levee pits, doing our work for us to some extent, but preventing our obtaining a sufficient supply to extend our work of distribution as intended and as the fine weather of the month and season seemed to warrant, our resources being confined to such places inside of the levees as overflow could not reach.



SALMON.

We append, in proper place, in appendix to this report, a list of rivers and creeks and their tributaries in this State. The list is, perhaps, as complete as has ever been published, and is compiled from that published in the United States Fish Commissioners' Report, added to from information obtained, as before stated, from our Representatives, and from personal inspection and survey of the Commissioners.

We also give a list of streams crossed by railroads, and nearest station, showing how they are reached. For these lists we are, in the main, indebted to the various railroad managements noted.

We give in this report a complete list of our native fish, with localities in which they are found, and their scientific and common names.

For this list we are indebted to Prof. S. A. Forbes, State Entomologist, to whom we desire to return our thanks for the labor and time expended in our behalf, in its preparation. Prof. Forbes has given the study of our native fish a great deal of attention, and his works and bulletins are among the standard authorities upon this subject.

HATCHING HOUSE.

So far we have made no effort to artificially propagate young fish, but, in our own opinion, the time has come when it will be necessary for the Commission to do some work in that direction. The great lakes have, for years, been planted with young white-fish and trout by the Government and the States adjoining them. Illinois, so far, has never contributed a fish, and when the immense benefit that has been derived from the fish business by our people is considered, it would seem that we are not acting as fairly as we might.

The Government has, as we understand, given our lakes white-fish and trout without such expenditure being warranted by the law making their appropriations, and cannot be depended upon as always doing the work for us.

The pike-perch, wall-eyed pike, can be artificially propagated successfully, and at very little expense. It is a fish that is meeting with great favor everywhere throughout our State, and in our opinion should be as extensively distributed as possible. The expenditure necessary to erect and maintain a hatching house suitable for the work indicated, would be small compared with the results to be accomplished, and can, we think, economically be made a part of our system.

We propose to adhere rigidly to our policy so successfully followed in the past, viz: Allowing nature to furnish from her great hatching houses the bulk of the native fish we use, and believe that the true theory of repopulating our streams is putting such fish in the waters as have been the nearest native to them. Yet figures will show that in the case of wall-eyed pike, and some other varieties, Dame Nature can be badly beaten in the percentage of increase by artificial propagation.

CARP.

Of this fish it is necessary to add but little to what has already been stated in former reports.

To say that it has fulfilled all our expectations, and has done all promised for it, is praise enough. In every instance, where suitable ponds have been prepared for them and anything like proper care given them, they have proved a success, attaining large size and increasing rapidly. We give a few instances of their rapid growth which have come under our own observation.

In the early part of this month—September—the Directors of Highland Park, Quincy, decided to have their pond seined in order to ascertain what they had there. The pond had been *perfectly dry* two years before. The officers had made application for some young carp, and on obtaining them, placed them in the pond, then filled for the first time.

In November, 1882, the pond was seined, and among others a carp was taken out that measured about 22 inches in length, and weighed *9 pounds 3 oz.* The fish was weighed by Pres. Hug, of the Park Association, in presence of Mr. D. F. Wilcox of the "Whig." The fish was cooked, and although in perhaps the poorest way a large fish could be cooked, viz: by frying, it was pronounced by all who tasted it to be above the average.

Dr. Adams of Spring Hill Park, Peoria, obtained through the Commission, two years ago, 20 carp, which he placed in a spring pond, or rather directly in the spring, at his place in Peoria.

For the first year, the Doctor tells us, the carp did not grow three inches. After some correspondence with the Commissioners, he became convinced that he had made a mistake in placing the carp in cold water, and took out 7 of them and put them in a pond formed from the overflow from an artesian well, temperature about 68° the year round. At less than two years of age one of the carp weighed $9\frac{1}{4}$ pounds, measuring 22 inches in length, a growth of over 1 pound a month from the time it was placed in warm water.

In another place in this report will be found extracts from letters from a large number of those who have received carp through the Commission.

Of the edible qualities of the carp a great deal pro and con has been said. From the best information we can gather, it is fully an average fish,—everything depending upon the manner in which it is cooked, and the time of year in which it is killed. Out of several hundred replies to inquiries made by the United States Fish Commission of those who had been supplied through them, but a few were unfavorable. A very large percentage claimed it to be excellent, a smaller proportion pronounced it fair, and but one or two pronounced it poor eating.

Hon. Thos. Cooper, Mayor of Pekin, caught a carp from his pond that weighed $6\frac{3}{4}$ pounds. He had it dressed and *baked*. He pronounced it as good a fish as he ever ate.

Henry Ruff, Esq., of Ruff Bros., brewers, took a carp from his pond, near the city of Quincy, that weighed over six pounds. He had it cooked, and sampled by himself and a number of friends, who pronounced it an excellent food fish.

On the other hand, from time to time have appeared through the press statements to the effect that the carp was of inferior quality, and almost unfit to eat. We have endeavored to trace these statements to reliable sources, but failed. We believe that the reason for more than half of these unfavorable opinions of the edible qualities of carp is that they have been eaten during the spawning season,—when they are easily taken—at a time when no fish should be eaten in order to test its qualities as a food fish.

Of the reproductive powers of the carp, the best of evidence has been given.

Mr. F. Rioth, of Mt. Sterling, procured some carp through the Commission in 1881 and 1882, and now reports his pond literally filled with young fish, and the old ones of immense size. His is an ordinary farm pond.

Worthy Frost, Esq., of Fowler, Adams county, placed ten carp in his pond in the Fall of 1881. He now has a large number of yearlings, weighing from two to three pounds, and as he expressed it, "the pond is as full as it can hold of fish five to six inches in length," these of this season's spawning. This, too, is an ordinary farm pond.

In July, of this year, we placed in basin of fountain in Washington Park, Quincy, five German carp, two scale, and three mirror varieties. They had been brought here in a tank from Aurora a few days before. When the fish were taken out, perhaps two months later, we found about 500 young carp. The basin is about 20 feet in diameter and 2½ feet deep. It contains nothing on which to deposit the spawn save a few rocks about the fountain and four pipes used as jets.

The fish were two years old, weighing about 3½ to 5 pounds, and did not, when placed in pond, present any signs of being ripe.

Of the adaptability of the carp to our rivers, etc., we have to offer the following facts:

In the early part of July we received a letter from a firm of fishermen at Naples, Ill., on Illinois River, stating that they had caught a fish out of the river that was new to them, and giving description of it, from which we judged it to be a mirror carp, and telegraphed them to save it alive until we could send a tank for it, which we did on the following day. The fish, on arrival, proved to be a mirror carp, a fine specimen, weighing something over 5 pounds. The fish, however, was dead on arrival, the extreme heat making it difficult to transport.

Mayor Cooper, of Pekin, informed us that he had purchased of a fisherman at Pekin a mirror carp, caught out of the river, weighing about 6 pounds. It was alive, and placed by him in his pond.

At Meredosia, also on Illinois River, a carp weighing 8½ pounds was caught, and is now in our possession, alive.

At or near Hannibal, on Mississippi River, a number of carp have been caught, weighing from 1½ to 5 pounds, showing beyond a doubt that there are carp of different ages in the river, and that a portion of the carp are those which have escaped from ponds, for from no other source could the carp have found their way into the river.

Above Quincy, on Mississippi River, at several times during this season, while the men have been taking the young native fish from the drying pools and levee pits, young carp have been taken almost too large for this season's spawning, yet not large enough for yearlings. They certainly must have been the increase of mature fish in the river.

Taking the facts altogether, it argues very favorably for the carp in our streams, and we have no doubt but that they will in time be numbered among our fish as native to our waters.

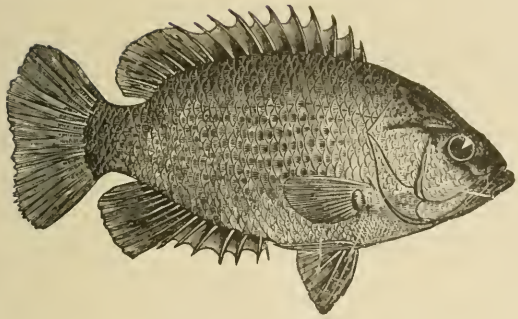
There has certainly been a decided increase in interest in the cultivation of the carp. Where five years ago there were probably not five carp ponds in the State, they are now numbered by the thousand, and some success must have been met with, as our lists show the greatest number of applicants from localities where they were first introduced.

There is a new variety of carp called the "Blue Carp," which is said to possess many good qualities. We have been promised a supply from U. S. ponds, and when received they will be placed in suitable ponds for purposes of propagation and ultimate distribution.

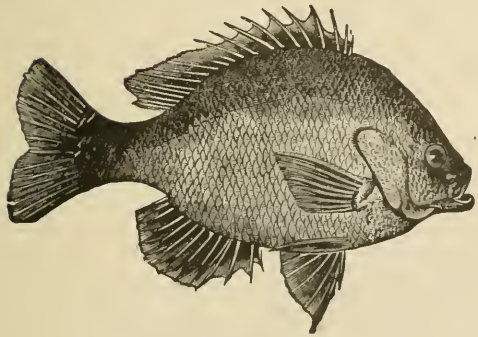
CARP DISTRIBUTION.

Our distribution of carp has been large, and indications are that our list for 1884 will exceed 1,000 names. In almost every instance ponds for their reception have been specially constructed, the expenditure by our agricultural people aggregating a very large amount of money.

It is possible for every farm to have somewhere within its borders a carp pond—on almost every farm can be found a spot good for nothing else. On *all*, space enough can be spared, and the revenue derived from such a pond will, we think, fully compensate for the loss of its use for other purposes. Many of our prairie farms are using drain tile, and in a number of instances great difficulty is found in disposing of the water. Why not dispose of this water satisfactorily and at the same time place upon the farm an ever increasing source of food supply? In other words make a level for the water, excavate a pond and stock it with carp. The cost would be slight, while the benefit to be derived would be great. The United States Fish Commission by their liberality in the past have enabled us to furnish a large number of applicants with carp, and have promised us a large shipment this fall. The distribution will be made from Quincy, Illinois, under the supervision of S. P. Bartlett. Live boxes have been provided for their reception, from which they are taken as the distribution progresses. A full record is kept



ROCK BASS.



BLUE SUN FISH.

of each lot issued, and fish are only furnished where evidence is given the Commissioners that applicant has a proper pond for their reception.

We should have had all the carp needed from our own ponds, but circumstances were such as to render their removal impracticable, and we will depend upon the general government for a supply, which with our purchase will, we think, supply all applicants.

Another season, with reasonable success, we shall be enabled not only to supply all applicants, but will have a sufficiency to commence putting them into our streams and lakes. We have arranged with the owner of the Spring Hill Park, Peoria, S. E. Adams, M. D., for the use of his ponds for breeding purposes, and have procured and placed in them a large number of mature fish. The ponds are from an artesian well, temperature at all seasons above 68°. Our experiments this season have demonstrated that the water is certainly the best for purposes of carp propagation of any we have found in the State.

FISH-WAYS.

As we have, in former reports, discussed at length the necessity of the enforcement of laws regulating the obstructing of streams by dams, it will be unnecessary to do so now. The fish-way cannot be dispensed with and the work of the Commission made successful. We have not insisted upon compliance with the law for the reason that we have been waiting for the opinion of the Supreme Court in the case of Parker *vs.* The People, in March term, 1883, in error to the Circuit Court of Kendall county. The opinion having been filed, and as we think it is of importance, settling as it does some grave constitutional questions, we give a copy of it herewith:

Mr. Justice Walker delivered the opinion of the Court:

This case involves the question whether an act of the General Assembly is, or not, unconstitutional. We are fully impressed with the gravity of the question involved, and the important, if not vast, results that must flow from its determination. There are few questions that more vitally concern the future interests and welfare of the people than does this question. Again, it is always a delicate matter to review the action of the other coordinate branches of government, who act under the same obligations to observe and support the constitution that are imposed upon us. We have, therefore, in view of these considerations, bestowed an unusual amount of labor, thought and pains in the investigation of the question, and shall proceed to state our conclusions.

The act under which this proceeding was instituted was adopted on the 31st of May, 1879, (Sess. Laws, page 171,) which is declared to be an amendment to a prior act. It provides: "That it shall be the duty of any person or persons who now owns, or may hereafter erect, any dam or other obstruction across any of the rivers, creeks, streams, ponds, lakes, sloughs, bayous or other water-courses within this State, to place therein suitable fishways, in order that the free passage of fish up or down or through such waters may not be obstructed." And it imposes a fine not exceeding $200 a year for not complying with the requirements of the statute, to be recovered before any justice of the peace of the county where such dam or obstruction may be situated. Defendant being the owner of a dam across Fox river, and refusing to comply with the law, was prosecuted before a justice of the peace, and on a trial a judgment was rendered against him. He appealed to the circuit court of the county, where a trial was had with the same result, and he brings the case to this court on error, and urges a reversal.

All the facts are conceded by stipulation of the parties. It is agreed that the dam was erected across Fox river, where it now stands, in the year 1836, and was raised to its present height in July, 1853, and has been so maintained ever since; that in 1842 Michael C. Parker, a remote grantor of plaintiff in error, purchased the land on which the mills and dam are situated, from the general government; that M. C. Parker, in 1857, procured the passage of an act of the General Assembly authorizing him, his heirs or assigns, to raise this dam higher, or to erect a new one at that place; that the dam always has obstructed, and now obstructs, the passage of fish in the river, and to construct a fishway in con-

formity to the act would cost about $600; that plaintiff in error has owned and used the mills and dam since in 1871, and maintained the dam at its present height since that time; that he has succeeded to and is possessed of all the rights with which Michael C. Parker was invested. These are the material facts of the case.

Plaintiff in error insists that he has a prescriptive right to maintain his dam as now constructed, as it has been used in its present condition, by himself and grantors, for more than twenty years; that the law requiring him to construct a fishway connected with his dam would be to deprive him of his rights without due process of law,—if intended for public use, without due compensation, or if for private use, then not only without compensation but without the semblance of constitutional warrant. He also contends that the act of 1857 was a charter, and as such is or contains a contract, and this law violates its obligation, and is repugnant to the contract clause of the Federal and State constitutions, and is therefore void. When the dam was erected it was without right and by a trespass on the lands of the government, and before Michael C. Parker purchased the land of the general government, the Legislature had by enactment, in 1840, (Sess. Laws, 98,) declared Fox river a navigable stream and public highway. It then follows that he purchased subject to the power of the Legislature to control the use of the stream to the same extent it had to regulate the use of other streams in the State which were navigable in fact. After the passage of that act Parker maintained his dam as an obstruction to a navigable river, and in violation of that law, because by the passage of that act it became public in its use, and its use was under the control of the Legislature. He, in all probability, to obtain a license to maintain his dam, procured the passage of the act of 1857, authorizing him to raise the height of the dam or to erect a new one; but did that act withdraw or surrender permanently the power of the General Assembly to protect the passage of fish in the stream? There is no rule of construction more familiar or more firmly established, than that all grants of powers must be taken most strongly in favor of the State and against the grantee. In such cases nothing passes that is not in the letter or by clear and unmistakable implication, and when the State makes a grant, the thing or right is subject to legislative control, precisely as other rights not derived from government; and, inasmuch as this was a license to maintain a dam in a navigable river, we have no right to hold that the legislature intended to repeal the act of 1840, so far as it related to the river above this dam. Such would be the effect if it should be held that Parker, his heirs or assigns, may maintain a complete obstruction at that place. It is not a reasonable inference that the General Assembly contemplated such a result. The act contains no language that in terms, or by implication, declares such a purpose. We must therefore hold that the license was made subject to legislative control. There is nothing in the act that warrants the conclusion that the General Assembly designed to permanently surrender any portion of its power of control over this river for the protection of fish. That the legislative branch of government has the power to prevent the erection and maintenance of obstructions in navigable streams can not be successfully controverted, and all must know that any obstruction to the passage of fish must necessarily obstruct the passage of boats and other water craft. We therefore have no hesitation in saying that the legislature, if it had the power, never intended by that act to permanently abandon the control for the free passage of fish in this river. Had it intended to repeal or amend the act of 1840, it is but reasonable to suppose it would have been done in terms.

There are some things, and they are the most essential of all to man, that are incapable of individual ownership. Such are air and water. All may and do participate, without restraint, in their enjoyment. They are the common inheritance of mankind. There are other things to a large extent incapable of individual ownership, and of these are game and fish, and they belong to the entire community, collectively; and belonging to all equally, for their protection from extinction, and to preserve the common ownership in all, they are, and of necessity have ever been, subject to legislative control. If they were not, the few would, by their destruction or appropriation, deprive the balance of the community of their rights in this common inheritance. Belonging to all, common justice requires their preservation for the use and enjoyment of all. From the wild and wandering nature of fish they are not, nor can they be, the subject of ownership in running streams, like animals and fowls which have been domesticated. The nature of fish impels them periodically to pass up and down streams for breeding purposes, and in such streams no one, not even the owner of the soil over which the stream runs, owns the fish therein, or has the legal right to obstruct their passage up or down, for to do so would be to appropriate what belongs to all to his own individual use, which would be contrary to common right, and all having a common and equal ownership, nothing short of legislative power can regulate and control the enjoyment of this common ownership. This must be so from absolute necessity. There is not, nor can there be, any other means of protecting each individual in the enjoyment of the rights his joint ownership confers, hence the necessity of legislative action to preserve and protect the rights of each and all in their common inheritance. Therefore the power of the legislature to act must be admitted.

The common law has always recognized the right of the riparian owner to take fish in the waters running over his own soil, and appropriate them to his own use; but the fish being the common property of the people, such owner has never had the right to obstruct their passage from that portion of the river which flows over his land, nor has he the right to wantonly destroy the fish passing over it, and thus deprive the community of their right to and ownership in the fish,—hence the manner in which, the time when, and the amount such riparian owner shall take, for the preservation of the common property, is a legislative and governmental function. Government was organized to protect the general and collective rights of the governed as fully as the individual rights of each member of the body politic,—and this power, as we shall see, has been exercised as a legislative function by the British parliament almost from the time of its organization.

At an early period, before and immediately after our State government was organized, the legislature adopted what is now Chapter 28 of the Revised Statutes of 1874, and that provision has ever since remained in force in this State. It provides: "The common law of England, so far as the same is applicable and of a general nature, and all acts of

the British parliament made in aid of and to supply the defects of the common law, prior to the fourth year of James I," (excepting several statutes specified), "and which are of a general nature, and not local to that kingdom, shall be the rule of decision, and shall be considered as of full force until repealed by legislative authority." We shall refer to Magna Charta and some of the early British statutes on this subject in aid of the common law, to show that under that law the regulation of the right to take fish, and for their increase and preservation, was always considered a legislative function. Under the common law, obstructions to the passage of fish were held to be public nuisances, and subject to legislative control.

That these rights were always, from the earliest times, considered of great public interest and of vast importance, is manifest from Magna Charta and the early British statutes. The arbitrary kings after the conquest claimed the game and fish in the Kingdom as a part of their prerogative, and conferred on their favorites and dependents royal franchises to take game and fish, to the exclusion of the people. This being in derogation of common right, there were many struggles to compel their monarchs to restore their ancient rights. The first that proved successful was in 1215, when King John was compelled to restore them by Magna Charta. The restoration of the rights it confirmed had been petitioned for during several previous reigns, but although promised, were never restored. Succeeding monarchs disregarded its provisions, but they were compelled to reaffirm the great charter. The 39th chapter of that instrument declares: "All kydells (weirs) for the future shall be quite removed out of the Thames and the Medway, and through all England, except on the sea coast." (Thomp. Es. Mag. Ch. 81.) This charter or declaration of rights was confirmed by Henry III, in 1216, (id. 112,) and again by the same monarch in 1217, (id. 125,) and a third time in 1224-25. (Id. 138.) It was also confirmed by Edward I, in 1297,—and in each of these confirmations the provision in regard to weirs is in precisely the same language. As illustrating the great importance attached to the right of fishery, the 48th chapter of the same charter provided: "All evil customs of forests and warrens, and foresters and warreners, * * * water banks and their keepers, shall immediately be inquired into by twelve knights of the same county, by oath, * * * and within forty days after inquisition is made they shall be altogether destroyed by them, never to be restored." Id. 85. This author, in his notes, (page 203,) says, speaking of this last provision of the charter: "It ordains that river banks shall not be defended excepting at their ancient places and boundaries; and its intent was, says Lord Coke, that no owner of such banks should in the future so appropriate or keep the rivers separate to himself as to prevent others from fishing or having passage at them. Sir Edward Coke says that Magna Charta and the Charta Foresta have "been confirmed, established and commanded to be put into execution by thirty-two several acts of parliament in all;" and inasmuch as this provision in regard to weirs seems to have been embraced in all of them, it establishes beyond all question that the power to control the exercise of the right of fishery was then, as it has been ever since, regarded as of national concern, and of such public importance as to form one of the chapters of the constitution or bill of rights of the British people, maintained only by long and bitter struggles.

The first statute we shall refer to is the 2d Westminster, 13th Edw. I. It provides: "The waters of Humber, Owse, Trent, Dove, Arre, Derewent, Wherfe, (Nid, Yore,) Swale, Tese, (Tine, Eden,) and all other waters, (wherein salmons be taken,) shall be in defence for taking salmons, from the Nativity of our Lady unto St. Martin's day; and likewise, that young salmons shall not be taken nor destroyed by nets, nor by other engines, at mill pools, from the midst of April unto the Nativity of St. John the Baptist; and in places (where as fresh waters be) there shall be assigned conservators of this statute, which, being sworn, shall oftentimes see and inquire of the offenders; and for the first trespass they shall be punished by burning of their nets and engines, and if they offend a second time they shall be punished by imprisonment for a quarter of a year, and if they offend a third time they shall be punished by imprisonment for a whole year, and as their trespass increaseth so shall their punishment." (1 Eng. Stat. at Large, 211.) The 13th Richard, 2 C. 19, contains similar provisions. The 1st Eliz. 17, prevents the taking of young fry or spawn of fish, and it also prohibits the taking of various kinds enumerated, under specified lengths. The 3d Jac. 1 C. 12, prohibits the erection of weirs at specified places, or using nets to destroy the fry or spawn of sea fish. And there are a number of ancient statutes that are local to counties or particular streams. There are other statutes of the same character adopted by parliament, on the same subject, that might be referred to. It thus appears that the preservation and the regulation of the mode and time of taking fish was of public concern, and a proper subject of legislation. It is thus distinguished from a mere private right not within the domain of legislation.

But as bearing on this question, as on the question of prescription, we will refer to some cases that shed much light on it. In *Weld* v. *Hornby*, 7 East, 195, Lord Ellenborough said: "The erection of weirs across rivers was reprobated in the earliest periods of our law. They were considered as public nuisances. The words of Magna Charta are, that 'all weirs from henceforth shall be utterly pulled down by *Thames and Medway, and throughout all England*,' etc. And this was followed up by subsequent acts treating them as public nuisances, forbidding the erection of new ones, and the enhancing, straightening or enlarging of those which had aforetime existed. I remember that the stells erected in the river Eden by the late Lord Lonsdale and the corporation of Carlisle, whereby all the fish were stopped in their passage up the river, were pronounced, in this court, upon a motion for a new trial, to be illegal, and a public nuisance. Now, here it appears that previous to the erection of this complete stone weir there had always been an escape for the fish through and over the old brush-wood weir, in which those in the stream above had a right, and it was not competent for defendant to debar them of it by making an impervious wall of stone, through which the fish could not insinuate themselves as it is well known they will through a brush-wood weir, and over which it is in evidence that the fish could not pass, except in extraordinary times of flood; and however twenty years' acquiescence may bind parties whose private rights only are affected, yet the public have an interest in the suppression of public nuisances, though of longer standing." In the same case, Lawrence, J., said: "There is no bar to the action from any length of possession in the defendant." That case was by an upper riparian proprietor, and it appeared by ancient

deeds that for two centuries before that time the owners of the mill and weir had the right to maintain them, as expressed in the deeds; nor did they limit it as to its height, nor the materials of which it should be constructed. It is true, in that case the cause of action accrued within twenty years, but Lord Ellenborough referred to a case decided in the King's Bench, where it was held that such obstructions were illegal, and a public nuisance, and he so announced the doctrine in the case he was then deciding. We are aware that in comparatively recent cases in the courts of that kingdom the doctrine of *Weld* v. *Hornby* has been disregarded, but we prefer the exposition of the common law in that case to the more recent decisions of their courts, and are inclined to follow it as the better doctrine.

In the case of *Eubank* v. *Pence*, 5 Litt. (Ky.) 338, which was a condemnation proceeding for the erection of a mill and dam, the court said: "The inquest of the jury, taken under the writ of *ad quod dammum* which issued in this case, not having ascertained whether or not fish of passage will in any degree be obstructed, the court erred in ordering the mill seat to be condemned, and in giving permission to Pence to erect a mill. The order, therefore, must be reversed, with costs, the cause remanded to the court below, and the inquest of the jury quashed," etc. The legislature of Kentucky at an early period adopted the common law of England, and all statutes of the British parliament in aid thereof, and of a general nature and applicable to the condition of the people, passed prior to the American revolution, with exceptions similar to our statute. But concede this was under a statute of the State, still it shows the preservation of fish was regarded as of such public concern as to fall within the domain of legislative power. If not under such an enactment, it must have been under ancient British statutes.

In the case of *Stoughton* v. *Baker*, 4 Mass. 522, (two years subsequent to the decision of *Weld* v. *Hornby*, *supra*,) Chief Justice Parsons, in delivering the opinion of the court, said: "But the right to build a dam for the use of a mill was under several implied limitations. One was, to protect private rights by compelling him to make compensation to the owners of land above, for, and damages occasioned by, overflowing their lands. Another was, to protect the rights of the public to the fishery, so that the dam must be so constructed that the fish should not be interrupted in their passage up the river to cast their spawn. Therefore, every owner of a water mill or dam holds it on the condition, or perhaps under the limitation, that a sufficient and reasonable passageway shall be allowed for the fish. This limitation, being for the benefit of the public, is not extinguished by any inattention or neglect in compelling the owner to comply with it, for no *laches* can be imputed to the government, and against it no time runs so as to bar its rights." Another objection, he says, was urged, that if the resolution was constitutional, the legislature might authorize strangers to enter without right on the freehold or lawful possession of another. To this he answered: "This objection, supposing strangers enter without right, is begging the question, for if the owner of the dam holds it under the limitation mentioned, that limitation must extend to give a right to the government to enter and remove obstructions, which, if not removed, would defeat the limitation." This case was followed by a number of cases, among others the cases of *Commonwealth* v. *Chapin*, 5 Pick. 199, and *Vinton* v. *Welsh*, 9 id. 87, which recognize the exclusive right of riparian owners to take fish on their own lands, but expressly hold, as against the public they have no right to obstruct their passage, and it is expressly held that the right is under legislative control.

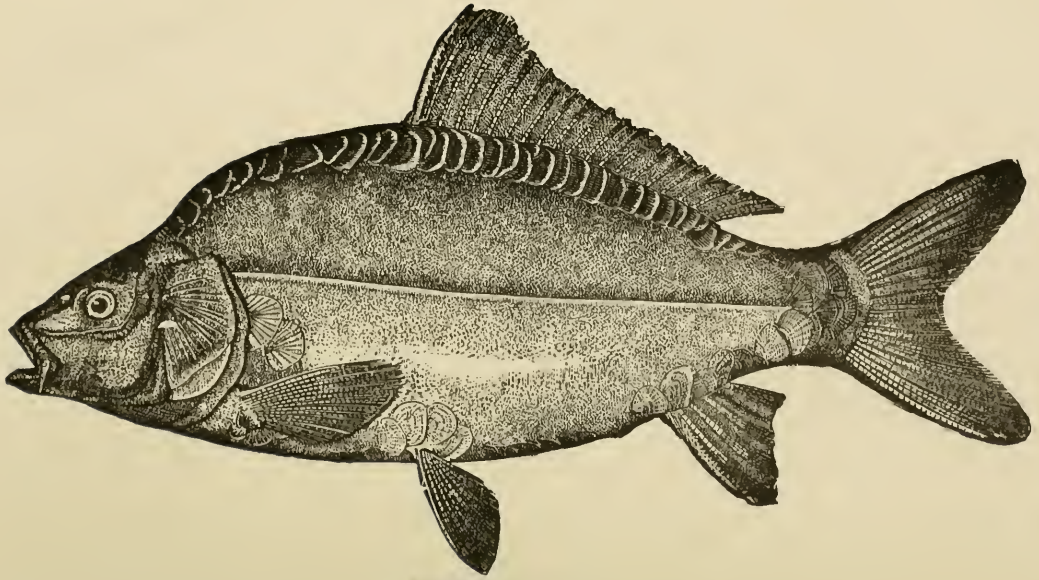
In the case of *Carson* v. *Blazer*, 2 Binn. 475, it was held that the common law never prevailed in the State of Pennsylvania, which recognizes the exclusive right of the riparian owner to take fish in a stream flowing in front of or bounding his land, and such has been the recognized doctrine of that tribunal ever since. It has been followed by subsequent cases in that court.

In the case of *Hooker* v. *Cummings*, 20 Johns. 90, the doctrine of the common law was fully recognized and applied, and it was said: "The legislature have, confessedly, the right of regulating and taking of fish in private rivers, and do every year pass laws for that purpose as to rivers not navigable in any sense, and which are unquestionably private property."

The cases here referred to fully establish the doctrine that whatever the private right of taking fish in streams flowing over a man's land, it is under the limitation that its exercise may be regulated and controlled, as public necessity may require; and they clearly announce the rule that their free passage may be secured by enactment, as it is secured by the common law.

As early as in 1807 the Territorial legislature of Indiana adopted an act for the purpose of preserving fish in our waters, this State then being a portion of that Territory. The act provided for the condemnation of mill seats by a writ of *ad quod dammum*. It required the jury impaneled, to assess damages by reason of constructing the mill dam; also, to inquire whether, and to what extent, fish of passage or migration would be obstructed, and by what means such obstruction could be prevented. This law was in force when our territorial government was organized. The provision in relation to fish was dropped out when the laws were revised, after the State government was organized, and only restored by the act to which this is an amendment. In 1817 the Territorial legislature passed an act authorizing Ezra Owen to erect a dam in the Kaskaskia River, for the purpose of taking fish. It contained a provision that the dam should not obstruct the passage of fish or ordinary navigation. (Sess. Laws 1817-18, p. 26.) This act was retained in the revision of 1819. (Laws, p. 351.) It is thus seen that in that early period of our history the legislative branch of our government claimed and exercised the power of preserving the fish in our waters. At that time it appears the exercise of the power was regarded as an inherent and unquestioned function of legislation.

But if any doubt existed, it is removed by the 22d section of article 4 of our present constitution. It provides that the General Assembly shall not pass local or special laws in a number of enumerated cases, and among the cases enumerated is "the protection of game and fish." This unmistakably recognizes the power as then existing, and undeniably authorizes its exercise. This must end all dispute as to the power. This limita-



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tion of the power of the legislature in all of the cases enumerated refers to matters of a public nature, and among them is the protection of fish, which was regarded so important to the public that the legislature was restricted and prevented from granting, by special or local law, any privileges or exemption from a general law. It was esteemed too important a public interest to permit any person, even with the consent of the legislature, to escape from conforming to any general law which should be passed on the subject.

All must admit that from the remotest times game has been the subject of protection by legislation in Great Britain, and in this country since its settlement; nor has any one, until recently, questioned the constitutional power to adopt such laws, and our constitution places both the preservation of game and fish on the same basis and equality. There is no question that more concerns the public than an abundant supply of cheap and healthy food. In a densely populated country it is the all absorbing question that engages the attention of its people and the government. It is the basis of the happiness, prosperity and contentment of all peoples. And with our unparalleled increase of population, vast as is our domain, in a generation more it will become the all absorbing economical question for the government to solve. Even now, in some portions of the Union, it is taxing the energy of the people and the wisdom of statesmen, to a high degree, to provide against pinching want; and it must be obvious to all that the question of the increase of the supply of food, and the preservation of the sources of its supply, are matters of the highest public concern. There are few, if any, questions that should attract the attention of the law-makers to a greater extent, because of its public importance. All will concede the vast importance of the commercial and manufacturing interests of the country, and in recognition of their importance these interests have received aid and protection from the government; but no one can say they are of paramount importance more than an abundant supply of cheap food for the people, nor should the sources of such a supply be sacrificed to either or both of the other great interests. Commerce, manufactures and trade concern the opulent or persons in easy circumstances, but the supply of food vitally concerns the struggling masses, upon whose labor the other interests are wholly dependent. Their labor is indispensable to the very existence of commerce, manufactures and trade, and their interests and wants are of as essential importance, and are as worthy of the protection of Government, as the others. The interests of an owner of a mill or factory do not require the sacrifice of this great public interest by strained construction or refined distinctions. Its regulation is manifestly as public in its character as many others that have always been under legislative control, and never challenged or even questioned.

We now come to the consideration of the effects and consequences of holding that private individuals may acquire prescriptive rights against the public. If such a doctrine were to obtain, it would amount to a repeal of this law. All the riparian owners on every stream in the State, and many others, could prove that they and their ancestors had, for more than twenty years, maintained weirs, and used seines, nets and other prohibited devices for the destruction of fish. If the claim of such prescriptive rights should be sustained, then all the fish in our streams would soon be destroyed, and the production of food decreased perhaps millions of dollars annually, and other food enhanced in price, so as to become oppressive to the poor and struggling masses,—and the question, for these reasons, will annually grow in importance with our unparalleled increase of population. No one has questioned the power of government to protect cattle, sheep and hogs from disease, or the power to pass and enforce restrictions for their preservation for food for the great mass of the people. This may not be so important an interest as either of the others, but there is no doubt it is of great public concern. The legislature has the power, and is charged with the duty, of passing all laws for the preservation of the liberties of the people and their morals, and to adopt all measures for the general welfare, and this law is eminently adapted to produce such results. At the ancient common law it was regarded as within legislative power to prevent the forestalling, regrating and engrossing of food, and they were prohibited by statute, for the protection of the people against unjust exactions in the price of food. If such were objects of legislation, then the preservation and increase of this article of food must necessarily be of great public, as contradistinguished from private, interest.

The act of 1857 does not possess a single ingredient of a charter for a corporation. It does not, in the remotest degree, refer to a corporation, or confer the slightest corporate powers or franchises, or anything which can be tortured into a grant of such franchises. If the courts may torture that act into a charter, or hold that plaintiff in error is a corporation, then it might be held that almost any law on the statute book is a charter, and creates a corporation. To so hold in this case would be to disregard all definitions, distinctions and relation of things. It surely is not expected that this or any other court could so hold. It is so palpable that the act is not a charter, it is useless to search for authorities, as no one before, we presume, ever conceived such an idea.

On thorough examination and earnest reflection, we are impelled to the conclusion that the General Assembly exercised legitimate and constitutional power in the adoption of the act of 1879, and did not thereby deprive plaintiff in error of any right of property or privilege. Nor did or could he acquire a prescriptive right against the public. We, for these reasons, conclude that this is one of the great purposes for which the State government was brought into existence, and the legislature has no competent authority to permanently grant or barter it away. That it may suspend the right, and license persons to create such nuisances, none can deny; but the license may be revoked at will, as the licensee acquires no vested rights under the license. This power can only be destroyed or withheld by the people when framing and adopting a constitution.

Perceiving no error in the record, the judgment of the court below is affirmed.

Judgment affirmed.

We shall use every effort possible to ascertain first the best and most economical fishway that can be used, for we do not care to foist upon any of our business interests an unnecessary expense, nor to do them an injury; but when such fishway shall be found, we must insist upon a full compliance with the law, for without a free and unobstructed course for our fish up and down our streams, our work, when done as best we can, is without practical results.

A number of owners of dams have constructed fishways over their dams; a number of others have signified their intention of doing so, and we feel confident that all will, when the matter is properly put before them, avoid any unnecessary litigation and do what they can to further the work of your Commissioners.

FISH LAWS.

Next to the propagation and distribution of the young native fish, one of the most important features in the work, if not the most important, is proper laws for the protection of fish.

As our laws now stand, they are not such as will accomplish the end to be desired. They were framed and passed at a time when the interest in fish culture and protection was really confined to what may be classed as the sportsmen element, the lovers of rod and line, and when they were placed on our statute books it was after considerable opposition.

But now, the case is different. The matter of a supply of fish in our waters has passed from one of mere sporting interest, to a serious question of food supply.

It is useless for the State to spend money in repopulating our streams unless the laws of our State, regulating their protection, can be made operative, and protection afforded.

Thirty years ago, every stream, lake and tributary in this State, one of the best in the Union so far as natural homes for fish is concerned, was filled with fish. The angler or farmer could obtain, without much effort, all the fish needed. As the State has filled up, catching fish for market was made a business, seemingly necessitated by the growing demand, until now we find our waters almost depleted of varieties once common and plenty. Within the last fifteen years it was of very common occurrence to see large fish offered, in our river towns, at prices so low that a poor man could obtain for a few cents all that he could use. Now, the coarsest fish we have has become a luxury, selling at from 6 to 10 cents a pound, according to locality and supply.

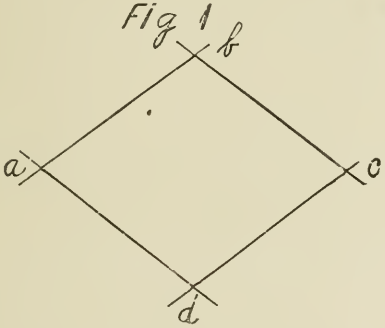
Ten million pounds of the buffalo fish have found their way into market, from the waters of our State, in a single year. It has been stated to your Commission that 400,000 pounds were taken in a single day by one gang of men on Illinois River. The rivers are lined with fish boats and rigs, and the constant drain and wholesale slaughter is simply immense, and is fast telling on the fish supply. In the great lakes, the same result is noted. Where but a few years ago the whitefish were very plenty—all know of the immense trade the lake fish have furnished,—to-day they are not only

scarce, but so scarce that the fishermen themselves are becoming alarmed at the future outlook, and have, through our conventions, asked that some laws be passed to protect them.

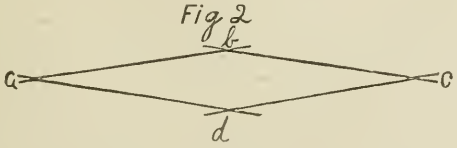
That our laws, as they now stand upon our statute books, are not operative, we will endeavor to show.

The act to amend section one (1) of an act entitled "An act to secure the unobstructed passage of fish in all the waters of this State wherein they were once accustomed to be found," approved March 22, 1872, in force July 1, 1872, approved May 31, 1879, in force July 1, 1879, contains the following clause: "That from and after the adoption of this act, it shall be unlawful for any person to use any seine or net for the purpose of catching fish, except minnows, in any of the waters of this State, the meshes of whose seine is less than two inches."

The framers of the law no doubt intended, when the lawful size of the mesh was made two inches, to mean two inches square, or to measure



two inches from "*a*" to "*b*" as shown in Fig. 1, the proper way to measure a mesh; but as soon as such law was passed, manufacturers and jobbers, to evade the law and find a market for their stock, issued price lists giving prices on seine or net-web measuring from "*a*" to "*c*" when drawn to its greatest length, as in Fig. 2.



As soon as information was filed and suit brought under this act for violation of our law, these price lists, supported by evidence of those engaged in such traffic, are brought in to prove such measurements, and in nine out of ten cases are held by court to be the correct way of measuring a mesh.

If the act is allowed to stand upon our books as a part of our protective laws, it should, at least, be amended so as to define beyond any question the meaning of the words "two inches," as applied to measurement of meshes. For with a seine whose meshes are two inches as measured by process described in Fig. 2, it would

make, as a matter of fact, but an inch square mesh, and by its use almost everything would be taken, even the fish placed in the waters by our system of distribution would in many instances be caught.

Section one (1) of "An act entitled an act to encourage the cultivation of fishes within the State of Illinois," approved and in force May 13, 1879, says:

"SEC. 1. [WHEN UNLAWFUL TO CATCH WITH SEINE, NET, ETC.] *Be it enacted by the People of the State of Illinois, represented in the General Assembly:* That it shall be unlawful for any person or persons to catch or kill any fish of species commonly called black, green, silver, or white bass, pike, pickerel, salmon, landlock salmon, jack salmon, croppy or grass bass, sun fish, sun perch or other fish commonly known as GAME fish, in or upon any of the rivers, creeks, streams, ponds, lakes, sloughs, bayous, or other water courses, wholly within or running through the State of Illinois, with any seine, net, weir or other device other than hook and line, from the fifteenth day of February to the fifteenth day of June in each and every year."

This law was evidently made to protect the fish during the spawning period, and was perhaps the best that could be passed at the time, but we find it open to the following objections:

First, The length of time for which it makes a close season.

Second, In not defining what shall be understood by the words "game fish."

Third, In not prohibiting *entirely* the use of seine or net during the time specified as a close season.

In the first place, four months does not cover the spawning season for all our native fish throughout the entire State. If a close season is needed at all it should be for six months.

Secondly, the words "game fish" have been variously construed, and in almost every instance when the matter has been brought into court, have been settled to mean such fish as readily take a live bait, excluding the cat fish, buffalo, white perch, native carp, shovel fish, etc. And as a consequence, the fishermen go on, make their hauls, catch anything and everything—taking care only that they are not caught taking any of the enumerated varieties—out of the seine, perhaps throwing them back when watched, but always turning up with fine fish in their possession, openly offering them for sale, leaving the people powerless to prosecute for want of evidence.

Third, we hold that the close season should be made, prohibiting the use of seines for the entire time, for the reason that the very object of the law—i. e.: the protection of the spawning fish and the spawn itself—is defeated by allowing a seine to be used at all, as the mere act of drawing a seine with its heavy leaded line on the bottom of a stream, lake or slough, *must* destroy every egg deposited there, even though not a scale of a game fish is injured. Thus it is possible for one drag of a large seine in a lake to not only deplete it of live fish, but absolutely to destroy all hope of any future increase, and in one hour accomplish more damage than could be repaired in a season's work by the Commission.

During what is known as the "rolling season" of the buffalo fish it is the almost universal custom of fishermen to go out upon the overflowed prairies with their trammel nets and seines, and watch for a "roll," i. e. a school of buffalo—usually found in some depres-

sion—and when found, to set trammel net, or surround with seine. These nets and seines, thus used in the grass and weeds, soon become filled with burs, sticks, grass, etc., and upon this as well as the nets themselves can be found in countless numbers the eggs of the buffalo, so that aside from the taking of the old fish, the act of using the seine or net must of necessity destroy the spawn, which if left for nature to develop would give us hundreds of thousands of young fish to supply in part at least the loss occasioned by the wholesale slaughter of the buffalo in other directions—by wing-nets —Tyke nets, set-nets, traps, and the varied devices used to catch the fish.

These reasons are presented to show why, in our opinion, our laws should be amended so as to prevent the use of the seine during the close season, and with such laws the work of your Commission would be materially aided. But, in point of fact, the use of the seine or net during any season of the year should be prohibited, at least for a number of years. Along the Mississippi and Illinois Rivers particularly are found hundreds of beautiful lakes, subject to overflow when the rivers are over their banks, but land-locked almost when the rivers recede.

These lakes are generally well stocked with fish by the overflow, but the fishermen, after carefully cleaning out all obstructions—as is often done—can by one haul with a seine take everything, settling for the season all prospects of a "catch" with hook and line.

This is not the case with one lake alone, but in every lake along the rivers is the process repeated. For eight months in the year our rivers, lakes and streams are subject to this piracy. With so many loopholes through which to escape, the fishermen as a class are bold and defiant, regarding any attempt to enforce the laws as an infringement on their rights. So much so is this the case, that out of the great number of complaints filed with the Commission, of parties violating the law, not one per cent. of the parties informing consent to appear as witnesses, or allow their names to be used in any way in the matter.

Iowa has been the first of the Western States to pass laws prohibiting the use of seines and nets, and by the prompt and rigorous enforcement of them by her efficient Commissioner, Hon. A. W. Aldrich, has succeeded in placing the waters of that State on a footing that may well be the envy of her sister States. Since April last Mr. Aldrich has caused to be destroyed 366 seines, and to-day has the State practically under control, so that every fish planted has at least a "fighting chance" for its life.

There is no State in the Union that has more advantages in the matter of natural homes for fish than has Illinois. A glance at the map will show a State almost bounded by water—rivers and lakes —from them, tributaries, and tributaries to tributaries, making a perfect net-work of streams, all fed by the Mississippi, acknowledged to be one of the finest streams for fish in the world.

Your Commissioners would respectfully recommend the passage of new or amendment of old laws to afford such protection to our fish as they must have, if the successful and practical restocking of the waters be accomplished. Also, that it be made the duty of some

one to see that such laws are properly enforced. A great deal of fault is found and blame attached to the Commission for not using greater efforts in enforcing existing laws. We can not find any warrant, further than is implied by our position, for making this a a part of our business, more than that of any other citizen, but we have, whenever evidence could be obtained, usurped such powers and prosecuted all cases that could be reached.

It will readily be understood that to do the necessary work of the Commission, as enumerated in this Report, must consume a large amount of time, and that to do all the work assigned them by a willing public would make it an exclusive business for them, which amount of time could not well be given under the circumstances, as, under our law, the Commissioners serve without compensation.

RAILROADS.

We desire to acknowledge the favors we have received from the various railroad managements of the State. We have had but to present our requests to have them granted, and have found them at all times willing and ready to aid us in every possible way, showing by their acts a substantial appreciation of the work, and that it is, as it should be, of a public nature entirely, benefiting all alike.

CONCLUSION.

In conclusion we would again urge the importance of the work of the Fish Commission, benefiting, as it does, the greater proportion of the people of the State, and the urgent necessity which exists for more stringent protective laws properly enforced, and we believe we cannot present our view of this matter more forcibly than by quoting the following extract from the opinion of the Supreme Court, as delivered by Mr. Justice Walker, a copy of which is given in full in another part of our report:

"All must admit that from the remotest times game has been the subject of protection by legislation in Great Britain and in this country since its settlement; nor has any one, until recently, questioned the constitutional power to adopt such laws, and our constitution places both the preservation of game and fish on the same basis and equality.

"There is no question that more concerns the public than an abundant supply of cheap and healthy food. In a densely populated country it is the all absorbing question that engages the attention of its people and the Government. It is the basis of the happiness, prosperity and contentment of all peoples. And with our unparalleled increase of population, vast as is our domain, in a generation more it will become the all absorbing economical question for the Government to solve. Even now, in some portions of the Union, it is taxing the energy of the people and the wisdom of statesmen, to a high degree, to provide against pinching want; and it must be obvious to all that the question of the increase of the supply of food, and the preservation of the sources of its supply, are matters of the highest public concern.

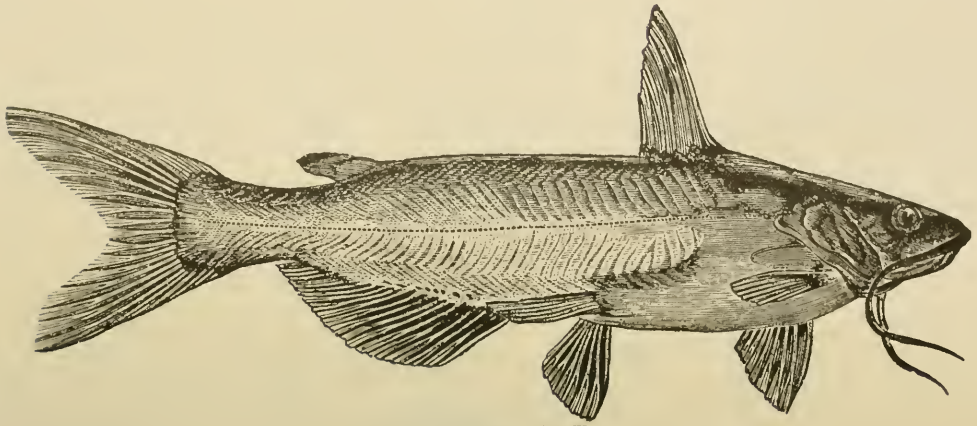
"There are few, if any, questions that should attract the attention of the law-makers to a greater extent, because of its public importance. All will concede the vast importance of the commercial and manufacturing interests of the country, and in recognition of their importance these interests have received aid and protection from the Government; but no one can say they are of paramount importance, more than an abundant supply of cheap food for the people, nor should the sources of such a supply be sacrificed to either or both of the other great interests. Commerce, manufactures and trade concern the opulent or persons in easy circumstances, but the supply of food vitally concerns the struggling masses upon whose labor the other interests are wholly dependent. Their labor is indispensable to the very existence of commerce, manufactures and trade, and their interests and wants are of as essential importance, and are as worthy of the protection of Government as the others."

Respectfully submitted,

N. K. Fairbank,
S. P. Bartlett,
Geo. Breuning.

Streams Crossed by Chicago, Burlington and Quincy Railroad in Illinois.

Points on Railroad.	Streams.	County.
Chicago to Burlington	Chicago River	Cook
	Des Plaines River	"
	Salt Creek	"
	East DuPage River	DuPage
	West DuPage River	"
	St. Jo Run	"
	Indian Creek	"
	Fox River	Kane
	Blackberry Creek	Kendall
	Rob Roy Creek	"
	Big Rock Creek	"
	Little Rock Creek	"
	Somonauk Creek	DeKalb
	Little Indian Creek	"
	Little Indian Creek	LaSalle
	Main Bureau	Bureau
	Coal Creek	"
	Pilot Creek	Knox
	Henderson River	Henderson
	Geneva Branch.	
Aurora to Geneva	Milis Creek	Kane
	Nelson Lake	"
	Head of Blackberry Creek	"
	Fox River Branch.	
Aurora to Streator	Fox River	Kendall
	Illinois River	LaSalle
	Indian Creek	"
	Buck Creek	"
	Covil Creek	"
	DuPage River	DuPage
	Rock Falls Branch.	
Shabbona to Sterling	Blackberry Creek	Kane
	Big Rock Creek	"
	Squaw Creek	DeKalb
	Somonauk Creek	"
	Greene River	Lee
	Rock River	Whiteside
	Elk Horn Creek	"
	Rock Creek	"
	Clinton Branch.	
Mendota to Fulton	Main Bureau	Bureau
	Pike Creek	"
	Walnut Creek	"
	Spring Creek	Whiteside
	Big Rock Creek	"
	Little Rock Creek	"
	Rushville Branch.	
Buda to Rushville	Coal Creek	Bureau
	Spoon River	Stark
	Cooper's Creek	"
	Nile Creek	Peoria
	Sugar Creek	Schuyler
	Spudaway Creek	Fulton
	Otter Creek	"



CHANNEL CAT.

Streams Crossed by Chicago, Burlington and Quincy Railroad in Illinois—Continued.

PEORIA BRANCH.

Points on Railroad.	Streams.	County.
Peoria to Galesburg	Spoon River	Knox
	French Creek	"
	Nile Creek	Peoria
	Kickapoo Creek	"

QUINCY BRANCH.

Galesburg to Quincy	Cedar Creek	Knox
	Centre Creek	McDonough
	Kepple Creek	"
	Crooked Creek	"
	Flour Creek	"
	Bear Creek	"

KEITHSBURG BRANCH.

Galva to Gladstone	Edwards Creek	Henry
	West Mud Creek	"
	Edwards River	Mercer
	Henderson River	Henderson

HANNIBAL AND LOUISIANA BRANCH.

Quincy to Hannibal and Fall Creek to Louisiana	Mill Creek	Adams
	Pigeon Creek	Pike
	Hadley Creek	"
	McCramy Creek	"
	Kaiser Creek	"
	Dutch Creek	"
	Sny Ecarte, near Hannibal	"
	Sny Ecarte, near Rockport	"

CARTHAGE BRANCH.

Burlington to Quincy	Bear Creek	Hancock
	Rock Creek	"
	Rock Creek	Adams
	Panther Creek	Hancock

ST. LOUIS DIVISION.

East St. Louis to Rock Island	Rock River	Rock Island
	Edwards River	Henry
	Pope Creek	Knox
	North Henderson Creek	"
	Middle Henderson Creek	Warren
	Cedar Creek	"
	Sugar Creek	"
	Swan Creek	"
	Illinois River	Cass
	Indian Creek	"
	Mauvaisterre Creek	Scott
	Big Sandy Creek	"
	Apple Creek	Greene
	Taylor Creek	"
	Macoupin Creek	Jersey
	Wood River	Madison

Streams Crossed by Chicago and Alton Railway in Illinois.

Streams.	Points on Railroad.	County.
Kankakee River	Near Wilmington	Will
Mackinaw River	Near Lexington	McLean
Salt Creek	Near Lincoln	Logan
Kickapoo Creek	Near Lawndale	"
Sangamon River	Near Springfield	Sangamon
Macoupin Creek	Near Macoupin	Macoupin
Wood River	Near Alton	Madison
Long Lake	Near Mitchell	"
Cahokia Creek	Near E. St. Louis	St. Clair
Macoupin Creek	Near Riverdale	Greene
Sangamon River	Near Petersburg	Menard
Illinois River	At Pearl	Pike
Vermlion River	At Pontiac	Livingston

Streams Crossed by Illinois Central Railroad in Illinois.

Chicago to Main Line Junction.

North Calumet River	Near	Riverdale
South Calumet River	Near	South Lawn
Kankakee River	At	Kankakee
Bushy Creek	Near	Neoga
Green Creek	Near	Sigel
Little Wabash River	Near	Mason
Dismal Creek	Near	Laclede

Cairo to East Dubuque.

Lower Cache	1 mile north of	Mounds
Upper Cache	At	Ulm
Drury Creek	At	Waukanda
Drury Creek	¼ mile north of	"
Big Muddy River	2 miles north of	DeSota
Little Muddy River	2 miles north of	DuBois
Crooked Creek	¾ mile north of	Central City
East Fork Kaskaskia River	4 miles north of	Patoka
North Fork Kaskaskia River	1½ miles north of	"
Flat Creek	1 mile north of	Vernon
Branch of Kaskaskia	2 miles north of	Shabonier
Hickory Creek	2¾ miles south of	Vandalia
Bear Creek	1¾ miles south of	Vera
Ramsey Creek	1¾ miles south of	Ramsey
Ash Creek	2½ miles south of	"
Opossum Creek	3¼ miles north of	Oconee
Coal Creek	1½ miles south of	Pana
Tranber Creek	1¼ miles north of	Moawequa
Sangamon River	1½ miles south of	Decatur
Salt Creek	3½ miles south of	Clinton
Kickapoo Creek	1 mile north of	Heyworth
Sugar Creek	1 mile north of	Bloomington
Mackinaw River	1 mile south of	Kappa
South Panther Creek	1½ miles south of	Panola
North Panther Creek	1½ miles north of	"
South Fork Sandy Creek	1½ miles south of	Wenona
North Fork Sandy Creek	2¾ miles south of	"
Illinois River	At	LaSalle
Bureau Creek	3 miles south of	Sublette
Inlet Creek	¼ mile south of	Amboy
Rock River	½ mile north of	Dixon
Buffalo Creek	½ mile north of	Polo
Leaf River	2 miles north of	Foreston
Yellow Creek	2 miles south of	Freeport
Preston's Creek	3 miles north of	"
Apple River	1½ miles north of	Apple River
East Fork Galena River	1 mile east of	Council Hill
East Fork Galena River	2¾ miles west of	"
Galena River	At	Galena
Sinsinway River	1⅓ miles east of	Monominee
Little Monominee River	At	"
Big Monominee River	4 miles west of	"

Streams Crossed by Illinois Central Railroad in Illinois—Continued.

MIDDLE DIVISION FROM CHICAGO.

Streams.	Points of Railroad.	Towns.
Vermilion River	1¼ miles north of	Charlotte
Vermilion River	1½ miles west of	Pontiac
FROM SPRINGFIELD.		
Sangamon River	Near	Springfield
Salt Creek	1¾ miles north of	Kenney
Salt Creek	3 miles south of	DeWitt

STREAMS CROSSED BY PEORIA, PEKIN AND JACKSONVILLE RAILWAY IN ILLINOIS.

Kickapoo Creek	3½ miles south of	Pekin
Illinois River	At	"
Lost Creek	2 miles south of	"
Mackinaw River	1 mile south of	Grand Bluff
Mud Creek	2 miles south of	Pekin
Quiver Creek	1¼ miles south of	Toseka
Sangamon River	1¼ miles north of	Chandlerville
Little Indian Creek	1½ miles south of	Little Indian
Big Indian Creek	1¼ miles south of	Petersburg
Mauvesterre Creek	1 mile north of	Jacksonville

STREAMS CROSSED BY WABASH, ST. LOUIS AND PACIFIC RAILWAY IN ILLINOIS.

Little Wabash River	Between Shumway and	Effingham
Okaw River	Between Windsor and	Bruce
Vermilion River	Between Pontiac and	Dorrell
Kankakee River	Between Essex and	Ritchie
Forked Creek	Between Ritchie and	Symerton
Horse Creek	Between Essex and	Ritchie
Hickory Creek	Between New Lenox and	Marley
Salt Creek	East of	Clinton
Sangamon River	Between Sangamon and	Decatur
Sangamon River	Between Riverton and	Springfield
Sangamon River	Between Decatur and	Boody
Sangamon River	Between Monticello and	Lodge
Sangamon River	Between Woods and	White Heath
Sangamon River	Between Monticello and	Argenta
Sangamon River	Between Taylorville and	Clarksdale
Illinois River	At	Meredosia
Illinois River	At	Valley City
Hadley Creek	Between Barry and	Kinderhook
Shoal Creek	Between Raymond and	Honey Bend
Cahokia Creek	Near	Edwardsville

STREAMS CROSSED BY OHIO AND MISSISSIPPI RAILWAY IN ILLINOIS.

Wabash River	At	Vincennes
Embarras River	1 mile east of	Lawrenceville
Little Wabash River	1 mile east of	Clay City
Kaskaskia River	At	Carlyle
SPRINGFIELD DIVISION.		
Illinois River	At	Beardstown
Spring Creek	3 miles southeast of	Springfield
South Fork of Sangamon	2 miles northwest of	Rochester
Flat Branch	1½ miles southeast of	Taylorville
Okaw River	2 miles southeast of	Cowden
Skillet Fork	1½ miles south of	Mill Shoal

Streams Crossed by Peoria, Decatur and Evansville Railway in Illinois.

Streams.	Points on Railroad.	Towns.
Illinois River	At	Pekin
Mackinaw River	8 miles south of	"
Sugar Creek	5 miles northwest of	Lincoln
Kickapoo Creek	2 miles northwest of	"
Salt Creek	3 miles south of	Mt. Pulaski
Sangamon River	1 mile south of	Decatur
Okaw (West Fork) River	5 miles northwest of	Sullivan
Okaw (East Fork) River	3 miles southeast of	"
Embarras River	At	Greenup
Embarras River	At	Grayville
Wabash River	At	Newton

Streams Crossed by Lake Erie and Western Railway in Illinois.

Kickapoo River	In	Sangamon County.
Sangamon River	In	Sangamon County.
West Fork Vermilion	In	Ford County
North Fork Vermilion	In	Vermilion County.

Streams Crossed by Chicago and Northwestern Railway in Illinois.

Rock River		
Fox River		
Des Plaines River	At	Maywood.
DuPage River	1½ miles west of	Winfield
West Kishwaukee River	At	DeKalb
Elk Horn River	1 mile west of	Galt
East Kishwaukee River	At	C. Valley
Nippersink River	3 miles south of	Richland
Pecatonica River	At	Freeport

Streams Crossed by Indianapolis, Bloomington and Western Railway in Illinois.

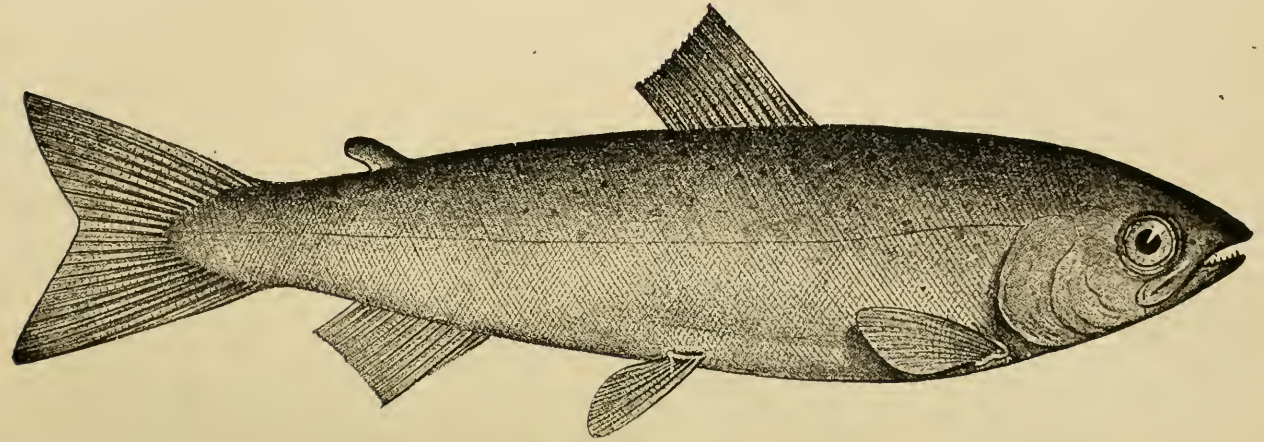
Vermilion River	At	Danville
Salt Fork	At	Oakwood
Mid-Fork Vermilion	Near	Danville
Sangamon River	At	Mahomet
Mackinaw River	At	Mackinaw
St. Joseph River	At	St. Joseph

Streams Crossed by Chicago and Eastern Illinois Railway in Illinois.

Calumet River	1 mile north of	Dalton
Calumet River	2 miles south of	Dalton
Kankakee River	At	Momence
Iroquois River	At	Watseka
Sugar Creek	Between Watseka and	Woodland
Little Vermilion	2 miles south of	Danville

Streams Crossed by Jacksonville and Southeastern Railway in Illinois.

Shoal Creek	Bond County	
Kaskaskia	Clinton County	



LAND LOCKED SALMON.

Mississippi River and its Tributaries Wholly or Partly within the State of Illinois.

Ohio River.
Big Muddy River.
Kaskaskia River.
Mary's River.
Illinois River.
Fox River.
Henderson River.
Edwards River.
Rock River.
Plum River.
Apple River.

Creeks Tributary to Mississippi River:

Clear Creek.
Fountain Creek.
Cahokia Creek.
Piasa Creek.
Kiset Creek.
Mill Creek.
Rock Creek.
Bear Creek.
Honey Creek.
Dugout Creek.
Cedar Creek.
Ursa Creek.
Pope Creek.
Eliza Creek.
Copper Creek.
Johnson Creek.
Big Rush Creek.
Small Pox Creek.

Tributaries to Ohio River:

Saline River.
    North Fork of Saline River.
    South Fork of Saline River.
Embarras River.

Tributaries to Big Muddy River:

Kingkaid Creek.
Beaucoup Creek.
    Pipe Stone Creek.
        Galum Creek.
    Little Beaucoup Creek.
    Swanwick Creek.
    Locust Creek.
    Painter Creek.
Big Crab Orchard Creek.
    Crab Orchard Creek.
Little Muddy River.
    Carson Creek.
Middle Fork of Big Muddy River.
    Ewings Creek.
Gum Creek.
Casey Fork.
    Atchinson's Fork.
    Ray's Creek.

Tributaries to Kaskaskia River:

Nine Mile Creek.
Plumb Creek.
Silver Creek.
    East Fork.
Big Muddy Creek.
Elk Horn Creek.
Sugar Creek.
Shoal Creek.
Beaver Creek.
    Flat Branch.
East Fork of Shoal Creek.
    Dry Creek.
Middle Fork of Shoal Creek.
West Fork of Shoal Creek.
Crooked Creek.
    Lost Creek.
    Great Point Creek.
    Prairie Creek.

Coles Creek.
Gibbs Creek.
East Fork Kaskaskia River.
    Bear Creek.
    Hurricane Creek.
Hickory Creek.
Camp Creek.
Booz Creek.
Suck Creek.
Big Creek.
Beck's Creek.
Richland Creek.
    Brush Creek.
Robinson Creek.
Sand Creek.
West Fork of Kaskaskia River.
    Apple Creek.
    Lake Fork.

Tributaries to Illinois River:

Otter Creek.
Macoupin Creek.
    Taylor's Creek.
    Joe's Creek.
    Solomon's Creek.
    Otter Creek.
    Bear Creek.
    Honey Creek.
Apple Creek.
Big Grassy Lake.
Big Sandy Creek.
    Little Sandy Creek.
Walnut Slough.
Bay Creek.
Mauvaisterre Creek.
McKei's Creek.
Willow Creek.
Indian Creek.
    Prairie Creek.
Crooked Creek.
    Little Missouri Creek.
    Cedar Creek.
    Grindstone Creek.
        Carter's Creek.
    Camp Creek.
    Troublesome Creek.
    Panther River.
    Bronson's Creek.
    Middle Creek.
    Long Creek.
    North Branch of Crooked Creek.
    Spring Creek.
Sangamon River.
    Big Panther Creek.
    Clary's Creek.
    Crane Creek.
    Salt River.
        Prairie Creek.
        Sugar Creek.
        Kickapoo Creek.
        Deer Creek.
        Salt Creek.
        North Branch Salt Creek.
        Lake Fork Salt Creek.
    Rock Creek.
    Spring Creek.
    Lick Creek.
    Sugar Creek.
    Brush Creek.
    South Fork.
        Bear Creek.
        Flat Branch.
    Lake Fork.
    Willow Branch.
    Goose Creek.
    Camp Creek.
    Madden Creek.
    Stevens Creek.
Otter Creek.
Spoon River.
    Big Creek.
    Putnam Creek.

Coal Creek.
Cedar Creek.
Swan Creek.
French Creek.
Sugar Creek.
Walnut Creek.
Quiver Creek.
Bucklin Creek.
Mackinaw Creek.
Mill Creek.
Walnut Creek.
Panther Creek.
Northwestern Branch Mackinaw River.
East Branch.
Six-Mile Creek.
Honey Creek.
Bray's Creek.
Henline Creek.
Kickapoo Creek.
Richland Creek.
Crow Creek.
North Branch of Crow Creek.
South Branch of Crow Creek.
Strawn's River.
Crow Creek.
Sandy Creek.
Clear Creek.
Big Bureau Creek.
West Bureau Creek.
Negro Creek.
Vermilion River.
Wolf Creek.
Otter Creek.
Scattering Point Creek.
Rook's Creek.
South Fork Vermilion River.
North Fork Vermilion River.
Covel Creek.
Fox River.
Big Indian Creek.
Indian Creek.
Mission Creek.
Somonauk Creek.
Battle Creek.
Blackberry Creek.
Fox Lake.
Squaw Creek.
Nipper Sink Lake and Creek.
Nettle Creek.
Waupcan Creek.
Mazon River.
West Fork of Mazon River.
East Fork of Mazon River.
Gooseberry Creek.
Au Sable Creek.
Saratoga Creek.
Kankakee River.
Prairie Creek.
Forked Creek.
Rock Creek.
Iroquois River.
Sangamon River.
Prairie Creek.
Spring Creek.
Sugar Creek.
Exline Slough.
Trim Creek.
Du Page River.
Lilly Cache River.
West Branch of Du Page River.
Jackson's Creek.
Des Plaines River.
Calumet River.
Little Calumet River.
Salt Creek.
Mill Creek.

TRIBUTARIES TO ROCK RIVER:

Mill Creek.
Green River.
Mineral Creek.
Spring Creek.
Mud Creek.
Coal Creek.

Hickory Creek.
Willow Creek.
Rock Creek.
Little Creek.
Sugar Creek.
Spring Creek.
Elkhorn Creek.
Five-Mile Creek.
Three-Mile Creek.
Pine Creek.
Clear Creek.
Kite River.
Leaf River.
Kishwaukee River.
Piasa Creek.
Coon Creek.
Rush Creek.
North Branch of Kent's Creek.
Pecatonica River.
Rock Run.
Pillow Creek.
Sugar River.
Otter Creek

TRIBUTARY TO HENDERSON RIVER:

Cedar Creek.

TRIBUTARIES TO EDWARDS RIVER:

Camp Creek.
East Branch.
West Branch.

TRIBUTARY TO APPLE RIVER:

Irish Hollow Creek.

EXTRACTS FROM CORRESPONDENCE.

CARBONDALE, ILL., July 12, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—* * I put 29 Carp received of you in December, 1881, in a wire cage an placed same in the pond in 4½ feet of water.

In the spring of last year I took some out and their weight was from ¾ to 1 pound. Not long after they broke out and I have not caught any of them since. * * Not long since I saw late in the evening, feeding on some cabbage leaves I had thrown into the water, a fish 15 to 18 inches long, which I took to be a Carp, and they would, I think, weigh 3 pounds. * * Respectfully, etc.,

D. H. BRUSH.

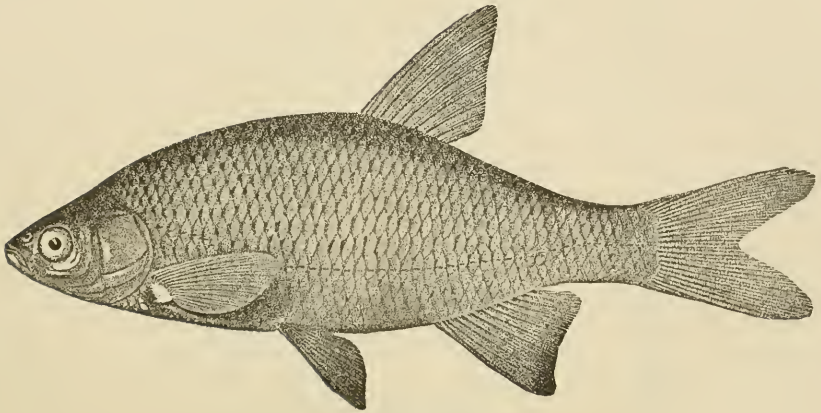
S. P. Bartlett, Esq.:

SPRINGFIELD, ILL., July 18, 1884.

DEAR SIR—In reply to your favor of the 15th, would state that the Carp you sent me are growing finely. We feed them bread scraps.

I should judge they are 12 to 15 inches long and seem to thrive. I never believed fish would grow so rapidly. Yours, respectfully,

ISAAC R. DILLER.



SHINER.

SPARTA, ILL., July 18, 1884.

DEAR SIR—* * In regard to my fish—we have not seen any of them until this spring. Have been feeding them sheaf oats, which seems to be the best feed we have given them. We caught one this spring 16 inches in length and weighed 2¼ pounds,—think it was our put-in of '82 shipment. Yours,

J. A. McKEE.

BUNKER HILL, ILL., July 19, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—* * Last year, in latter part of May, I secured a few Carp out of my pond. They were then 14 inches long and weighed 1¼ pounds; also caught some in August of '83, and could see they were doing well. Was at pond again late in September and found a lot of young Carp.

Have not fed them yet but will do so if I find there are too many in the pond, until I can dig another pond—which I intend to do if they do as well here as they do in Germany, where I came from. * * Yours, respectfully,

FRED BUMANN.

BEVERLY, ILL., June 2, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—Regarding fish received of you in the fall of 1881, will say they are doing finely.

I received both the Scale and Mirror Carp. The Scaled Carp have all disappeared except one. The Mirror Carp spawned at 2 years old and in the fall of '83 I seined out some fine specimens of young Carp. This spring I seined my pond again and found plenty of young Carp, and the old ones looking fine.

Last winter my pond was frozen over continuously for two months and not opened. * * Am well pleased with them and think they are a profitable fish for ponds, as they thrive well and are very prolific. One thing I am certain of, and that is that they spawned at 2 years old, for I received them very small in the fall of 1881, and in the fall of 1883 seined young Carp out of my pond. Yours, very truly,

WM. W. ROBERTSON.

SKELTON, July 14, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—Yours of the 5th at hand. Of my Carp I cannot say much. Went into my pond with a seine this spring and took out four Carp—two large and two small ones. The large ones weighed nine and eleven pounds respectively. * * There is one female Carp in the pond that I have seen frequently, that will weigh, perhaps, twenty pounds.

Yours, respectfully,

JNO. SKELTON.

CARPENTER, ILL., July 28, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—* * The Carp you sent me last fall are now doing finely and will weigh from 1¼ to 1¾ pounds. * * I received a few Carp from a friend in Missouri a year and a half ago and they will now weigh 4 to 5 pounds each. * * Yours truly,

J. F. OPEL.

PAWNEE, ILL., July 16, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—* * Was enabled through you last fall to put into my pond sixty German Carp, shortly after cold weather setting in. I did not see them until this spring (June 1) when I caught four of the little fellows at the edge of the pond, and they were quite perceptibly larger

Saw one of them swimming in the water about a week ago and he seemed to be about 5 inches long. Am satisfied that they are doing well. * *

Very respectfully,

CHARLES KERR, M. D.

VIRDEN, ILL., July 27, 1884.

S. P. Bartlett, Esq., Secretary:

DEAR SIR—Received from the United States Commission at Washington, in November, 1881, a consignment of German Carp, perhaps one inch in length.

They were put in a pond 30x150 feet, with an average depth of 3 feet, and first examined in May, 1883, when they measured 17 inches in length; and again in May, 1884, when they were 24 inches long with an average weight of 5 pounds.

They spawned the second year and again the present year, the increase being *very* large, from which other ponds are being stocked. * *

Very truly yours,

C. G. RYAN.

LEMONT, ILL., July 10, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—I have seen two lots of young Carp from those sent me in 1881. Have not seen them for two months; think they are in the mud.

They have increased finely.

Yours respectfully,

S. W. NORTON.

ASHLEY, ILL., July 22, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—* * My Carp were about 2 inches long when received, November 1, 1883; they are now from 8 to 12 inches long, will eat scraps from the table, oats, corn or fresh meat of any kind, and are very gentle.

Make a noise at the pond where I feed them and they will come up like pigs to be fed. They are the nicest fish I ever saw. When they have been in the pond one year I would not take $50 for them.

Yours respectfully,

WM. A. SMITH.

GREENFIELD, July 21, 1884.

Hon. S. P. Bartlett:

DEAR SIR—Yours of the 5th at hand; I think, from present condition of Carp received from you, they are doing well.

Hope to demonstrate the fact by another season by trying them.

Yours, etc.,

WM. H. ELLIS.

CATLIN, ILL., July 12, 1884.

S. P. Bartlett:

DEAR SIR—Your postal at hand; in answer would say that Carp received in December 1881, are at present 16 inches in length, and those received in March, 1883, are at present 10 to 12 inches in length. I was perfectly astonished at the growth from March until last fall—1½ inches in March to 10 inches in the fall. * * Have not taken any out of the pond, as I regard them as too precious to eat. I think some of them have spawned, as I saw some little fish about one-half inch long at the edge of the pond. * *

Yours respectfully,

G. W. F. CHURCH.

IONA, ILL., July 22, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—In reply to yours of the 5th inst.: in the winter of 1881 I received ten Carp and in 1882 twenty more, which I placed in my pond.

I see some of the fish every day and they appear to be about 18 or 20 inches long, and others about 5 or 6 inches long, which I suppose is some of their young. They seem to eat anything and are doing exceedingly well. * *

Yours, etc.,

CHARLES VENN.

MCLEANSBORO, ILL., July 23, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—* * * I put the fish I received about three years ago in my pond, and have not seen them but once since, and that about two months ago. * * * They are from two to two and one-half feet long, and very handsome. * * * Have seen no young Carp, but suppose pond being so large is the reason. I like them better than any fish I know of. They have been no trouble whatever. I turned them loose in my pond, and they take care of themselves.

Yours, etc.,

S. W. HEARD.

MT. VERNON, ILL., July 23, 1884.

Mr. Bartlett:

DEAR SIR—* * * My fish are doing well. I caught two, and they weighed two pounds and three ounces. I feed them once a day, and can see them come up to get their feed.

Yours, etc.,

D. HENSHEY.

BUNKER HILL, ILL., July 21, 1884.

DEAR SIR—* * * I got a seine and made two drags in my pond. The first time I caught two Carp and the second time two. The largest one of the four was 24 inches long and weighed six pounds. The smallest one was 21 inches long and weighed five pounds. These must be some of the first lot I received of you two years ago next October. I also went to see Mr. Patrick seine his pond, Carp put in last fall. He caught nineteen Carp the first haul. They are a foot long, and growing finely. * * *

Yours truly,

R. K. BARNES.

O'FALLON, ILL., July 19, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—Have seen some of the Carp you sent me in the fall of '82. They are doing finely, and will weigh from eight to ten pounds. * * *

Yours truly,

JNO. BEHRENS.

FOWLER, ILL., June 25, 1884.

S. P. Bartlett:

DEAR SIR—I received ten Mirror Carp from you Dec. 27, 1881, which were between 3 and 4 inches long, put them in my pond the same day, and did not see them until July, 1882, and from that until May, 1883, did not see them again. From that on through the summer and fall saw them frequently, and from their wake in the water judged them to be about one foot long, but in November I caught one that measured 24¼ inches long and 7 inches deep. They spawned for the first time in May. * * * My pond covers a little over ½ of an acre, and has an average depth of 4 feet.

Yours truly,

WORTHY FROST.

PERCY, ILL., July 14, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—My fish are doing well. Think they are well adapted to our waters, and are a quick maturing fish, with little food.

Yours truly,

R. J. SHORT.

MARION, ILL, July 20, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—In regard to condition of my Carp, can say my pond is pretty well stocked. Have some Carp that are quite large, and will weigh 6 to 8 pounds. Many from last year's spawn that are good-sized, also many of this year's spawn that are 1 to 1½ inches in length. I feed them almost every day on bread, so I can see all sizes eating it as it floats on the water. * * * Am well pleased with my success.

Yours truly,

A. W. JEFFRESS.

MONMOUTH, ILL., July 10, 1884.

S. P. Bartlett:

DEAR SIR—* * * Will say our Carp are growing very nicely. Some of them are quite tame, and although our pond is quite large and deep, a little food thrown in at any time will quickly bring the fish into view. They are now about 7 inches long.

Yours truly,

WEIR PLOW CO.

PRINCETON, ILL., July 26, 1884.

Hon. S. P. Bartlett:

DEAR SIR—Yours of the 5th, in regard to Carp, at hand. The first lot of Carp which were put into my pond in December, 1881, as minnows, now weigh from 5 to 7 pounds. As my pond overflowed and I thought first lot were gone, you sent me a second lot in April, 1883; these will now weigh from 2 to 3 pounds. * * They are now fed since last May on boiled potatoes, bread and scraps from the table, and they come up like pigs for their feed.

Yours, truly,

C. G. CUSHING.

ST. JOHNS, ILL., July 26, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—* * The Carp received by me two years ago last December are all alive and doing finely. We run a net through the pond a few days ago and found the original 15 and the pond *full* of young Carp. * * Yours, truly,

M. C. WRIGHT.

ASHLEY, ILL., July 10, 1884.

S. P. Bartlett, Esq.:

DEAR SIR—Yours of the 5th received and noted. We put our Carp, 20 in number, in a tank and sunk in the pond; during the cold weather we lost 16 of them, the remaining 4 we turned loose in the pond and they made a rapid growth—weighing, the second year, 6 and 7 pounds. * *

They will do exceedingly well here in our section and are just what we want. * * *

Truly yours,

COFFER & HARRISON.

BRADFORD, ILL., July 30, 1884.

S. P. Bartlett. Esq.:

DEAR SIR—Yours at hand. My Carp are all right and growing finely. They are now 12 to 15 inches in length. I did not feed any until I received your card. I now feed corn, wheat, potatoes, etc., and they jump around in the water like so many pigs. I am well pleased with the Carp. Yours,

JOS. CAYWOOD.

GERMAN CARP DISTRIBUTED.

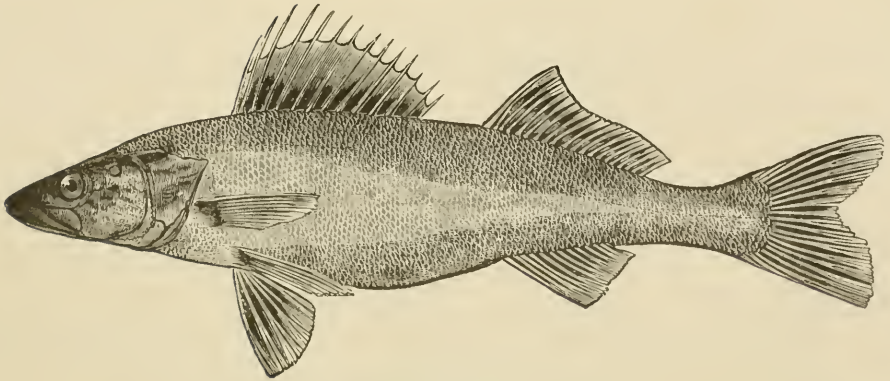
Name.	County.	Residence.	Date of Shipm't.	No.	Area of Pond.	Depth.	Remarks. Township and Section.
Jno. Hug	Adams	Quincy	Nov. 13	20	⅛ acre.	6 ft.	City of Quincy
Jo Hug	"	"	"	20	⅛ "	6 "	" "
Q. Burgessor	"	Clayton	"	20	1 "	4 "	T. 2, Sec. 4, W
J. Q. Burgessor	"	"	"	20	1 "	5 "	T. 1, W. 5 W
Jas. Kirkpatrick	"	"	"	20	½ "	4 "	" Clayton, Sec. 34
O. Wallace	"	"	"	20	¼ "	4 "	" Clayton
J. S. Campbell	"	"	"	20	¼ "	4½ "	Sec. 31, T. Clayton
C. S. Curry	"	"	"	20	½ "	7 "	" 9, " Concord
H. R. Motter	"	"	"	20	⅛ "	5 "	" 34, " 1 W. 5 W
Jno. McCoy	"	"	"	20	¼ "	4 "	" 34, " 1 W. 5 W
Geo. Campbell	"	"	"	20			
J. A. Bickell	"	"	"	20			
J. M. Eull	"	Quincy	" 15	20	1 acre.	10 ft.	
Wm. Mitchell	"	Fowler	"	20	¼ "	4	
Henry Whitmore	"	Quincy	"	20			
Henry Whitmore	"	"	"	20			
Henry Whitmore	"	"	"	20			
B. Brooks	"	Camp Point	"	20	2 acres.	5 ft.	Sec. —, T. Camp Point
Wilks Crippin	"	"	"	20	½ "	4 "	" —, " " "
S. L. Crippin	"	"	"	20	2 "	5 "	" —, " " "
E. M. Wheeler	"	Newtown	"	20	¼ "	5 "	" —, " Burton
Ira Coe	"	Quincy	"	20	1 "	6 "	" —, " Melrose
Ira Coe	"	"	"	20	½ "	5 "	" —, " "
J. R. Wible	"	"	"	20	⅛ "	4 "	" —, " Ursa
Wm. Bingert	"	"	"	20	½ "	4 "	" —, " Melrose
Jno. Sykes	"	Beverly	"	20	½ "	9 "	" —, " "
Jas. Sykes	"	"	"	20	¼ "	7 "	" —, " "
M. Huffman	"	"	"	20	⅛ "	5 "	" —, " Beverly
Cris Booth	"	Camp Point	"	20	½ "	2 "	" —, " Camp Point
S. F. Hall	"	"	"	20	¼ "	1½ "	" —, " "
R. Strawbridge	"	Columbus	"	20	2 "	3 "	" 14, " Gilmer
Yank Klamer	"	Quincy	"	20	¼ "	4 "	
Henry Ruff	"	"	"	20	¾ "	8 "	
A. E. Ruff	"	"	"	20	¾ "	8 "	
Casper Ruff	"	"	"	20	¾ "	8 "	
B. B. Lummis	"	"	"	20	¼ "	5 "	Sec. 30, T. 1 S. 7 W
D. W. Orr	"	Payson	"	20	1¼ "	10 "	" 31, " 3 S. 7 W
J. A. Wallace	"	Camp Point	" 16	20	½ "	3 "	" —, " Camp Point
Wm. Booth	"	"	"	20	¾ "	5 "	" —, " " "
D. C. Lewis	"	Clayton	"	20	½ "	4 "	" —, " " "
H. M. Lewis	"	"	"	20	½ "	4 "	

Carp Distribution—Continued.

Name.	County.	Residence.	Date of Shipm't.	No.	Area of Pond.	Depth.	Remarks. Township and Section.
W. T. Yeargin	Adams	Quincy	Nov. 17	20	¼ acre	4½ ft.	Sec. 32, Tp. Gilmer
J. F. Hughes	"	Adams	"	20	¼ "	4 "	Tp. Burton
P. E. Thompson	"	Payson	" 18	20	¼ "	3½ "	Sec. 1, Tp. Payson.
Dr. Rittler	"	Quincy	"	20			
Jno. B. Schott	"	"	" 22	20	¾ acre	6 ft.	
D. Nations	"	Liberty	"	20	1 "	4 "	Sec. 28, Tp. Liberty.
E. Prince, Quincy Water Works	"	Quincy	"	100			For reservoir.
M. Nations	"	Liberty	"	20	1 acre	5 ft.	Sec. 28, Tp. Liberty.
O. H. Bennett	"	Clayton	" 23	20	⅛ "	6 "	" 4, Tp. 1 S, 5 W.
Lew. Davis	"	Lima	" 24	20	⅛ "	4 "	" 20, Tp. Lima.
P. Horn	"	Fowler	"	20	1 "	8 "	" 31, Tp. 1.
Geo. Ramsey	"	Marblehead	" 27	20	½ "	5 "	" 5, Tp. Fall Creek.
J. O. Lyttle	"	Liberty	"	20	⅛ "	3 "	" 12, Tp. 2 S, 7 W.
Irvin Black	"	Clayton	Dec. 1	20	1 "	7 "	" 20
S. N. Black	"	"	"	20	1 "	7 "	" 20
C. W. Dean	"	Adams	" 4	20	⅛ "	3 "	" 14, Tp. Burton
Dr. Koch	"	Quincy	"	20			
Jno. Ferguson	"	Burton	"	20	¾ acre	6 ft.	Sec. 32, Tp. Burton
Jas. Cubbage	"	Loraine	" 22	20	1½ "	5 "	" 28, Tp. Keene
G. A. Yenter	"	"	"	20	½ "	8 "	" 16, "
Cris Seals	"	"	"	20	1¼ "	6 "	" 28, "
C. H. Seals	"	"	"	20	1¼ "	6 "	" 28, "
M. M. Seals	"	"	"	20	1 "	5 "	
E. Bowles	"	"	"	20	1½ "	6 "	Sec. 28, "
T. Bowles	"	"	"	20	1½ "	6 "	" 28, "
J. D. Tuken	"	Coatsburg	" 28	20	⅓ "	8 "	" 5, Tp. Columbus
J. T. Barber & Co	"	Quincy	"	20			
Jas. Jacobs	"	"	"	20	⅛ acre	3 ft.	
Si Winkles	"	"	"	20	¼ "	3 "	
R. P. Meek	Woodford	Eureka	Nov. 13	20	¼ "	4 "	Sec. 26, Tp. Conger.
Jno. Darst	"	"	" 27	20	⅛ "	3 "	" 7, Tp. 26.
B. Bockmuehl	Montgomery	Litchfield	" 13	20			
C. W. Seymour	"	Hillsboro	" 14	20			
W. H. Brewer	"	"	"	20			
Glenn Bros	"	"	"	40	2 acre	4 ft.	
J. Cress	"	"	"	20	1½ "	7 "	Sec. 34, Tp. 9.
J. M. Truett	"	"	" 17	20	2 "	4 "	
Solomon Harkey	"	"	" 18	20	¼ "	5 "	Sec. 23, Tp. 9.
T. B. Judson	"	"	" 28	20	½ "	6 "	
A. Wenter	"	Litchfield	" 30	20	⅛ "	3 "	
W. B. Tube	Knox	Abingdon	Nov. 13	20	¼ "	3 "	Secs. 11 and 15, Tp. 2 S., 10 E.
A. M. Ryder	"	"	"	20	½ "	3 "	Sec. 35, Tp. Cedar
O. W. Leffingwell	"	Knoxville	" 14	20	½ "	3 "	Knoxville Seminary

L. C. Meadows	"	Abingdon	"	21	20	¼	"	3	"	Sec. 6,	Tp. 9 W. 1 E.
L. Bloomfield	"	Rio	"	22	20						
B. Kasenberg	Mercer	Viola	"	13	20	2	acre	3	ft.	Sec. 31,	Tp. 15.
W. H. Heaton	"	Keithsburg	"	27	20	½	"	3	"	" 23,	Tp. 13 N. 5 W.
T. D. Merryman	"	New Windsor	Dec.	1	20	2	"	5	"	" 9,	Tp. 14.
L. Duncan	St. Clair	O'Fallon	Nov.	13	20	2	"	20	"	Tp. 2	
J. C. Behrens	"	"	"		20	1½	"	6	"	Sec. 22,	Tp. 2 N. 7 W.
O. D. Bates	"	"	"	14	20	½	"	5	"	" 3,	Tp. 1.
Eli Buckley	Randolph	Centerville	"	13	20	½	"	8	"	Sec. 14,	Tp. 5.
J. F. Blair	"	Sparta	"	14	20	½	"	3	"	" 14,	Tp. 5.
R. J. Short	"	Percy	"	16	20	¼	"	5	"	" 14,	Tp. 5.
J. Keller	"	Steeleville	"	18	20						
D. Scheck	"	"	"	21	20	1	"	4½	"	Secs. 25 and 26,	Tp. 6.
Wm. Werre	"	Wine Hill	"	21	20	½	"	8	"	Sec. 4,	Tp. 7.
M. Miller	"	Percy	"	27	20	2	"	4	"	" 14,	Tp. 6 S. 5 W.
R. J. Short	"	"	Dec.	1	20						
J. Hawken	"	"	"	12	20	½	acre	4	ft.	Sec. 11,	Tp. 6.
J. A. McKee	"	Sparta	"		20	½	"	5	"	" 13,	Tp. 5.
D. E. Detrich	"	"	"		20	2	"	10	"	" 36,	Tp. 4.
Capt. J. S. Burke	Jersey	Brighton	Nov.	13	20	4	"	20	"	" 12,	Tp. Piasa.
Mrs. Lucy V. Ames	"	Jersey Landing	"	15	20	1	"	6	"	Near Elsa	
W. H. Yates	Pike	Griggsville	"	13	20	1	"	4	"	Sec. 6,	Tp. 4 S. 3 W.
T. W. Parker	"	"	"	15	20	1	"	3	"	" 12,	Tp. Griggsville.
J. H. Crane	"	Pittsfield	"	18	20						
J. C. Hillyer	McDonough	Macomb	"	13	20	⅓	acre	5	ft.		
Eli Brown	"	Bushnell	"	14	20	½	"	8	"	Tp. Bushnell	
Perry McDonald	"	Adair	"	16	20	¼	"	8	"	Sec. 11,	Tp. New Salem.
August Seibold	Peoria	Peoria	"	13	20	1¼	"	4	"	City of Peoria	
C. E. Adams	"	"	"	14	40	1	"	8	"		
B. L. T. Bourland	"	"	"	17	20	½	"	10	"	Tp. 8 N. 8 E.	
C. L. Cromwell	"	"	"	21	20	2	"	6	ft.	Sec. 21,	Tp. 9
A. J. Welch	"	"	"		20						
J. W. Fulton	Brown	Mt. Sterling	"	13	20						
S. W. Jennings	"	Mound Station	"		20	¾	acre	6	ft.	Sec. 16,	Tp. Lee.
S. W. Robisson	"	"	"	23	20	1	"	6	"	" 16,	" 1 S. 4 W.
J. S. Ratkin	Warren	Swan Creek	"	13	20	¾	"	4	"	" 19,	" Swan.
J. D. Beatty	"	New Berlin	"		20	½	"	6	"		
Chas. Venn	"	Alexis	"		20	2	"	6	"	Sec. 4,	Tp. Kelley.
H. S. Baker	LaSalle	Tonica	"		20	½	"	7	"	" 30,	" Vermilion.
J. F. Parker	Kankakee	West Sumner	"		20	1	"	7	"	" 19,	" Sumner.
H. Foster	Cass	Beardstown	"		20	¼	"	4½	"	" 18,	
A. Foster	"	"	"		20	¼	"	6	"	" 18.	
Wash. Groff	"	Ashland	Dec.	1	20						
B. C. Smith	Fayette	St. Elmo	Nov.	13	20	½	acre	4½	ft.	Sec. 27,	Tp. Erena.
T. A. Tribble	Mason	Mason City	"		20						
O. Wilhelm	Stephenson	Florence Station	"		20						
G. W. Mitchell	Coles	Charleston	"		40	½	acre	5	ft.	Tp. 12	
R. S. Hodgen	"	"	"	27	20	4	"	15	"	Sec. 15,	Tp. 12 N., R. 9 E.
Hunt Bros	McHenry	Greenwood	"	13	40	4	"	4	"	" 35,	" 46.
J. H. Latimer	"	Huntley	"	14	20	3	"	3	"	" 24,	" 43.
R. K. Barnes	Macoupin	Bunker Hill	"	13	20	1	"	9	"	" 22,	" 7.
Fred. Burman	"	"	"	14	20	1	"	8	"	" 21,	" 7.

NAME.	County. –	Residence.	Date of Shipm't.	No.	Area of Pond.	Depth.	Remarks, Township and Section.
R. K. Barnes, *for son*	Macoupin	Bunker Hill	Nov. 18	20	½ acre	5 ft.	Sec. 22, Tp. 7
Ferd. Brother	"	"	" 28	20	2 "	4 "	" 26, " 8
J. T. Sargent	"	Carlinville	Dec. 30	20	2 "	2½ "	" 16, " 10
Balfour Cowen	"	Virden	" 1	20	15 "	4 "	" 21, " 12
W. G. Dalashenutt	Clark	Martinsville	Nov. 13	20	½ "	4 "	" 6, " 10
J. A. Noves	Union	Anna	" 14	20			
C. E. Kirkpatrick	"	"	"	40	1 acre	10 ft.	For Fair Grounds
S. Mendenhall	Sangamon	Springfield	" 13	20	1 "	2 "	City of Springfield
Lee Hickox	"	"	" 14	20	2 "	4 "	Sec. 16, Tp. Springfield
J. E. Laswell	"	"	" 21	20	2 "	5 "	" 16, " 16
J. M. Striffler	"	"	" 22	20	2 "	8 "	" 16, " 16
B. Hickox	"	"	" 24	20	2 "	4 "	" 16, " 16
Leland & Wiggins	"	"	Dec. 20	20			
W. H. Connell	"	Pleasant Plains	" 30	20	1¼ acre	4 ft.	Sec. 25, Tp. 17
Edward Tomlin	"	"	"	20	½ "	3 "	
Isaac Smith	Gallatin	Ridgeway	Nov. 14	20	1 "	3 "	Sec. 19, Tp. 8
G. C. Thomas	Effingham	Montrose	"	20			
L. M. Colt	Winnebago	Beloit	"	20	1 acre	5 ft.	
S. T. Bussy	Carroll	Urbana	"	20	½ "	5 "	
P. J. Hurd	Ogle	Rochelle	"	30	1 "	2 "	Sec. 28, Tp. 4
S. W. Solenberg	"	Polo	Dec. 30	20	½ "	3½ "	" 39, " Pine Creek
O. S. Knapp	Will	Wilmington	Nov. 14	20	3 "	2 "	" 4, " 33
F. M. Doan	Morgan	Jacksonville	"	20	¾ "	5 "	" 8, " 15
Jno. Gordon	"	"	"	20	1 "	5 "	" 5, " 14
W. D. Sanders	"	"	" 16	20	¾ "	12 "	" 23, " 13, R. 10 W
H. L. Doane	"	"	" 21	20	½ "	5 "	" 8, " 15
B. Davenport	"	"	"	20	½ "	2 "	" 8, " 15
S. W. Fleaton	"	"	"	20	1 "	4 "	" 6, " 14
Edgar Gordon	"	"	"	20	1¼ "	4 "	" 5, " 14
Geo. T. Hamilton	"	"	" 24	20	10 "	5 "	
B. F. Beasley	"	"	"	20	8 "	10 "	
Jno. Robertson	"	"	Dec. 4	20	3 "	10 "	Sec. 1, Tp. 15
J. W. Boston	"	"	" 5	20	1 "	6 "	" 23, " 15
I. J. Ketcham	"	"	" 28	20			
J. D. Beatty	"	Waverly	" 30	20	½ acre	10 ft.	Sec. 2, Tp. 13
Geo. Hunsaker	Hancock	Carthage	Nov. 14	20	½ "	6 "	" 13, " 5
J. R. Hudson	"	Loraine	" 22	20	1½ "	8 "	
S. Dickinson	"	Bentley	" 27	20	1 "	4 "	Sec. 2, Tp. Harmony
J. P. Walker	"	Warsaw	" 30	20	½ "	7 "	" 14, " 4
J. D. Stevens	"	"	"	20	1 "	8 "	" 14, " 4
D. H. Cox	Hancock	"	Dec. 30	20	1 "	8 "	" 14, " 4
Sam Scott	"	"	"	20	1 "	8 "	" 14, " 4



SAND PIKE.

C. S. Walker	"	"	"		20	1	"	8	"	"	14,	"	4
E. W. Bennett	"	Carthage	"		20	⅛	"	4	"				
David Wright	Greene	Carrollton	Nov.	15	20	3	"	5	"	Sec.	15,	Tp.	10
A. J. Tunnell	"	"	"		20	1	"	5	"	"	37,	"	10
T. P. Rafferty	"	Whitehall	Dec.	12	20					For C., B. & Q. Ry			
L. L. Haworth	Macon	Decatur	Nov.	15	20	1	acre.	5	ft.	Sec.	17,	Tp.	16
S. Weaver	"	Forsythe	"		20	½	"	3	"	"	33,	"	Mason
Max Kuhl	Madison	Alton	"		20	1	"	5	"				
Conrad Meyer	"	St. Jacobs	"	18	20	1	"	6	"	Sec.	16,	Tp.	3
Conrad Meyer	"	"	"	27	20	1	"	8	"	"	16,	"	3
Edw. Wyman	"	Alton	Dec.	30	20	1	"	5	"				
J. Tremmel	"	"	"		20	1½	"	4	"				
August Beiser	"	"	"		20	1	"	6	"				
Wolf Bros.	"	Edwardsville	"		20	15	"	15	"	Sec.	11&14,	Tp.	4&8
S. A. Hogue	Clinton	Collins Station	Nov.	10	20	⅙	"	8	"	"	22,	"	2, R. 2 W
Henry Shurman	"	Breese	Dec.	28	20								
C. W. Davenport	Henry	Cambridge	Nov.	16	20	¾	acre.	4	ft.	Sec.	12,	Tp.	15 N. R. 2 E
J. C. Hart	Piatt	Monticello	"		20	1½	"	6	"	"	33,	"	19
Wm. Davies	Saline	Friendville	"	17	20	5	"	10	"				
Thos. Cooper	Tazewell	Pekin	"	18	20	15	"	10	"	Sec.	35,	Tp.	25
J. B. Irwin	"	"	"	24	20	15	"	6	"	"	35,	"	25
Emil Arnold	Fulton	Woodstock	"	18	20								
Jno. Betz	Marion	Centralia	"	21	20	2	acres.	5	ft.				
Geo. Heppert	"	"	"		20	2½	"	7	"				
J. H. Shoup	White	Carmi	"		20	1	"	5	"	Tp. Carmi.			
D. Vanhise	Logan	Mt. Pulaski	"	23	20	1	"	8	"	Sec.	14,	Tp.	Mt. Pulaski
W. H. Mann & Co	Iroquois	Gilman	"	27	20	½	"	5	"	"	31,	"	27, R. 14 W
S. Dill	Champaign	Harwood	"	28	20	½	"	5	"	"	33,	"	22
C. Brown	"	"	"		20	½	"	3	"	"	33,	"	22
Jas. Hieman	Edgar	Walnut Grove	Dec.	11	20								
D. D. Huston, Jr.	"	Paris	"		20	25	acres.	3½	ft.	Sec.	9,	Tp.	15
Maginnis & Boyle	Cook	Chicago	"		20	5	"	30	"	Tp. Lake View			
A. W. Walker	Jasper	Newton	"	12	20								
Geo. Hartsock	DeWitt	Clinton	"	30	20	¾	acre.	4	ft.	Sec.	12,	Tp.	19
A. M. Seeley	Warren	Centralia	"		20	¼	"	4	"				
W. W. Barr	Jackson	Carbondale	"		20	1	"	6	"	Sec.	8,	Tp.	10
Griff Frost	"	Edina	Nov.	20	20								
W. H. Thomas	"	LaGrange	"	16	20	⅛	acre.	6	ft.				
J. H. Speres	"	Grand Haven	"	21	20								
W. R. Woodard	H. & St. Jo Ry	Clarence											
W. R. Woodard	"	Palmyra											
W. R. Woodard	"	Nettleton											
W. R. Woodard	"	Cameron Junction											

Garp Distribution for November and December.

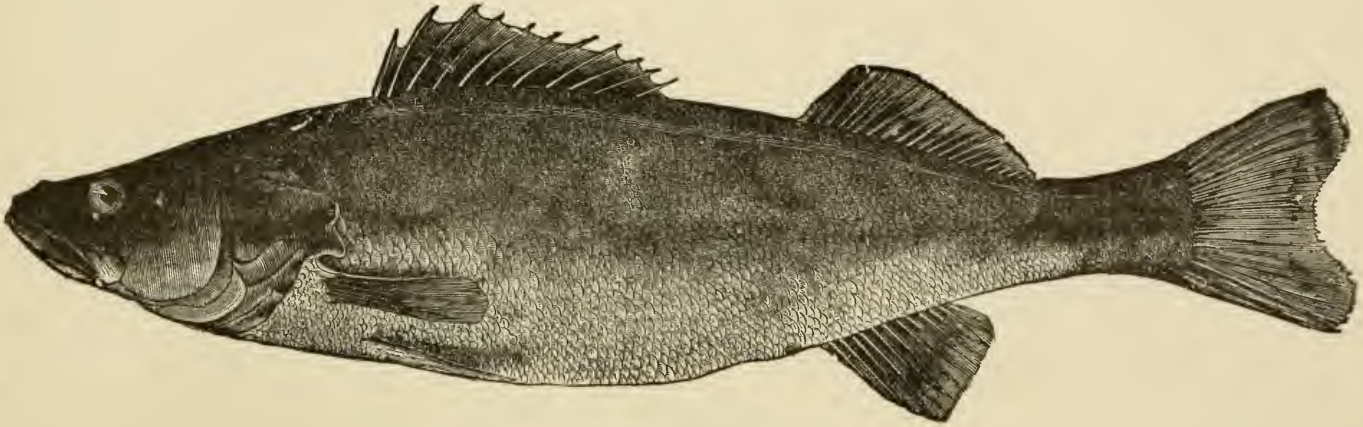
Name.	County.	Postoffice Address or Residence.	Date of Shipm't.	No.
Askew, Isaac	Pike	Bayliss	Nov. 16	20
Adams, E. H.	Peoria	Elmwood	" 21	20
Arnold, J. F.	Adams	Quincy	" 15	20
Archer, John Q.	Fremont	Shenandoah	" 14	20
Atkins, John H	Cook	Arlington Heights	Dec. 1	20
Allen, Charles J	Cumberland	Hayeldell	Nov. 29	20
Brook, F. P.	Jefferson	Watertown	" 13	20
Bush, J. M	Pike	Pittsfield	"	20
Briddell, T.	"	"	"	20
Bowers, M. E	Peoria	Elmwood	" 14	20
Bradshaw, Charles	Warren	Kirkwood	" 15	20
Beckett, J A.	Adams	Clayton	"	20
Black, Iona	"	"	"	20
Black, W. L.	"	"	"	20
Black, J. M.	"	"	"	20
Black, H.	"	"	" 16	20
Black, J. N	"	"	"	20
Bryant, B. W.	"	"	"	20
Brook, F. P.	Jefferson	Watertown	"	20
Borop, Niles	Bureau	Bureau	" 17	20
Baker, C. E.	Cook	Chicago	"	20
Buck, J. J	Hamilton	McLeansboro	"	20
Biggs, Jno	Cass	Ashland	" 19	20
Brooks, Jno	Clark	Casey	"	20
Blackaby, J	Fulton	Civer	"	20
Blair, A.	Henry	Genesee	"	20
Bowers, H. G	Peoria	Elmwood	"	20
Bacon, B. B.	Piatt	Bement	"	20
Burgess, C. M.	"	"	"	20
Booth, W. A.	Adams	Camp Point	" 20	20
Booth, C. L.	"	"	"	20
Barter, E. A.	Sangamon	Pawnee	"	20
Barrett, W. E	Jasper	Wheeler	" 21	20
Burt, E. E	Peoria	Elmwood	"	20
Bowers, C. L.	"	"	"	20
Bates, O. C.	St. Clair	Oak Hill	" 22	20
Bauer, Chas	Macoupin	Bunker Hill	"	20
Bauer, Theo.	"	"	"	20
Behrens, J. C	St. Clair	Oak Hill	"	20
Burke, J.	Jersey	Brighton	" 23	20
Bowher, Wm.	Macoupin	Medora	"	20
Bonoediet, P. A.	Kankakee	Belle Park	" 24	20
Baldwin, G. H	Adams	Mendon	" 26	20
Baldwin, H. W.	"	"	"	20
Buckner, J.	Cumberland	Neoga	" 27	20
Beers, T. W	Henderson	Kirkwood	"	20
Butter, N. K	Hancock	West Point	"	20
Bourbough, E. J	"	Elvaston	" 29	20
Barrow, Jno	Pike	Price	Dec. 6	20
Crane, J. H.	Pike	Pittsfield	Nov. 15	20
Coe, Ira	Adams	Quincy	" 13	20
Coe. Ira	"	"	"	20
Coquillette, W. E	Hancock	La Harpe	" 14	20
Cunningham, J. A	Cass	Virginia	" 15	20
Chapin, N. A.	Warren	Kirkwood	"	20
Chandler, J. E	Pike	Milton	" 16	20
Caywood, Jos	Bureau	Milo	" 17	20
Cooper, Thos	Tazewell	Pekin	"	20
Cooper, Thos	"	"	"	20
Craig, W. T.	Adams	Clayton	" 20	20
Clark, W. M	Morgan	Ashland	"	20
Clark, L. B.	Hancock	Elvaston	" 23	20
Carrillon, Chas	Bond	Pleasant Mountain	" 25	20
Chambers, J. J.	Shelby	Richland	Dec. 3	20
Diller, Isaac R	Sangamon	Springfield	Nov. 14	20
Duncan, J. R.	Moultrie	Sullivan	"	20
Dorsey, T. B.	Madison	Dorsey	"	20
Dunn, J. H	Linn	Meadville, Mo	" 19	20
Dorsey, W. B.	Madison	Dorsey	" 23	20
Day, Wm. H.	Champaign	Condit	" 27	20
Debolt, Cyrus	LaSalle	Ottawa	" 28	20
Daly, C. C	Jersey	Delhi	"	20
Daly, Chas	"	"	"	20

Carp Distribution—Continued.

NAME.	County.	Residence.	Date of Shipm't.	No.
Eells, R	Hancock	Bowensburg	Nov. 14	20
Eisenmayer, A. J	Clinton	Trenton	" 15	20
Eldredge, Thos	Jersey	Brighton	" 19	20
Ellis, Wm. H	Greene	Greenfield	"	20
Emminga, H. H	Adams	Clayton	" 27	20
Fuller, Clinton	Stark	Elmira	" 14	20
Fuller, Walter	"	"	"	20
Fuller, Laton	"	"	"	20
Fleichbein, C. P	St. Clair	Belleville	" 15	20
Fishey, J. G	Hancock	LaHarpe	"	20
Freeman, J. E	Jasper	Newton	"	20
Furst, Oscar	Peoria	Peoria	" 16	20
Forster, Peter	Randolph	Moberly	" 20	20
Gay, E	Pike	Pittsfield	" 13	20
Grigg, George	Mason	Manito	" 14	20
Grafe, Harmon	Marion	Centralia	" 15	20
Gilbert, T. L	Knox	Knoxville	" 19	20
Green, John	Henderson	Kirkwood	"	20
Grimshaw, Owen	Washington	Ashley	"	20
Groff, Wash	Morgan	Ashland	" 20	20
Gintz, Adam	St. Clair	Belleville	" 22	20
Guss, Benjamin	Pike	Barry	" 28	20
Hawthorne, G. E	Kane	Dumser	" 12	20
Henry, A. C	LaSalle	Mendota	"	20
Hynes, Gorden & Co	Livingston	Ocoya	" 14	20
Hoglinus, Rev P	Effingham	Teutopolis	"	20
Hathaway, George	Peoria	Elmwood	"	20
Hughes, L	Adams	Burton	" 15	20
Heligenstein, L	St. Clair	Mascoutah	"	20
Hollister, H. A	"	Muscatine	"	20
Harris, John B	Jasper	Newton	"	20
Heath, W. L	"	"	"	20
Houlten, E. R	Warren	Kirkwood	"	20
Hartmann, B	St. Clair	Belleville	"	20
Holdmer, D	Clinton	Carlyle	" 16	20
Henderson, W. J	Vermilion	Ropeville	"	20
Henderson, Edwin	Macoupin	Barr's Store	"	20
Harris, W. H	Tazewell	Tremont	" 17	20
Hulitur, John	Bureau	Princeton	"	20
Heimrich, George	St. Clair	Belleville	"	20
Hickox, Lee	Sangamon	Springfield	"	20
Howell, I. J	Schuyler	"	"	20
Hershmann, Charles	Sangamon	Loami	"	20
Hedgecock, Joshem	Schuyler	Plymouth	"	20
Heligenstein, Leonard	St. Clair	Mascoutah	" 19	20
Hughes, J. T	Adams	Adams	"	20
Holdemann, W. F	"	Fall Creek	"	20
Howell, I. J	Henry	Woodhull	"	20
Hine, Adam	Lee	Jackson	"	20
Hinckley, T. D	Washington	Hoyleton	"	20
Heppert, George	Marion	Centralia	" 20	20
Henry, T. N	Shelby	Windsor	" 21	20
Hughes, C. L	Pike	New Canton	" 28	20
Huffman, John	Coles	Charleston	" 30	20
Hodgen, R. S	"	"	"	20
Ingram, Gene	Hancock	LaHarpe	" 27	20
Johnson, L	Henderson	Galesburg	" 17	20
Jessup, J. L	Jasper	West Liberty	" 19	20
Johnson, J. S	Adams	Camp Point	" 20	20
Johnson, Elisha	Fulton	Canton	" 30	20
Kenady, L. H	Pike	Hulls	" 13	20
Kemp, L. D	Peoria	Elmwood	" 14	20
Know, Henry	Cass	Mt. Etna	"	20
Kimble, William	Adams	Fall Creek	"	20
Kelley, J. C	Clark	Casey	"	20
Kastrup, F. W	Washington	Venedy	"	20
Kemp, Everett	Peoria	Elmwood	"	20
Kenes, D. K	Warren	Kirkwood	" 15	20
Kirkwood Min. Spring Co	"	"	"	20
Kenetz L. J	St. Clair	Belleville	"	20
Kerr, M	Sangamon	Pawnee	" 20	20

Carp Distribution—Continued.

Name.	County.	Residence.	Date of Shipm't.	No.
Kelly, William	Vermilion	Danville	Nov. 24	20
Kinnidy, David	Cumberland	Neoga	" 27	20
Kinney, John T	"	"	"	20
Kerr, A	Sangamon	Pawnee	Dec. 1	20
King, W. H. H	Morgan		" 3	20
Lovelady, T. A	Perry	Tamaroa	Nov. 14	20
Lawless, O. P	Adams	Columbus	" 15	20
Lawless, T. T	"	"	"	20
Lewis, Perry			"	20
Lambert, Hardin	Lawrence	Bridgeport	"	20
Little, David	Jasper	Wheeler	" 16	20
Lummis, B. B	Mercer	Preemption	"	20
Lummis, L. L	Adams	Quincy	" 19	20
Lawton, John	"	"	"	20
Lemley, George W	Whiteside	Morrison	" 20	20
Loebridge, J. R	Adams	Quincy	"	20
Lee, L. L	Sangamon	Pawnee	"	20
Laughlin, Jos	Cass	Bluff Springs	" 21	20
	Washington	Addieville	" 24	20
Mitchell, H. M	Adams	Cliola	" 13	20
McCann, S. E	"	Fall Creek	" 14	20
Morrell, S. H	Moultrie	Sullivan	"	20
Marko, F	Macoupin	Palmyra	"	20
Mattson, E	Cumberland	Greenup	" 15	20
McCorry, John	Pike	Pittsfield	"	20
Monahan, G	Cumberland	Greenup	"	20
Miller, A	Brown	Mound Station	" 16	20
Moore, F. P	Adams	Quincy	" 19	20
Mermyer, J. A. M	"	"	"	20
Miller, T. L	Will	Beecher	"	20
Mullen, D. H	Peoria	Peoria	"	20
McKee, J. H	Randolph	Sparta	"	20
Morris, David	Macoupin	Bunker Hill	" 20	20
McClure, J. W	Sangamon	Pawnee	"	20
Montgomery, G. A	Moultrie	Sullivan	" 22	20
Meyer, Mary E	Washington	Addieville	Nov. 24	20
Murphy, Wm. K	Perry	Pinckneyville	"	20
Meyer, James E	Washington	Addieville	"	20
Meyer, John	"	"	"	20
Mitchell, M	Vermilion	Danville	"	20
Mathews, H. C	Pike	Rockport	" 27	20
Moor, Robert	Henderson	Oquawka	" 28	20
Mason, Phil	Jasper	Wheeler	"	20
Murray, A. D	Cook	Arlington Heights	Dec. 2	20
Noble, U. A	Shelby	Windsor	Nov. 14	20
Norton, S. W	Cook	Lemont	" 16	20
Nelson, F. E	Knox	Galesburg	" 17	20
Nelson, Peter J	"	"	"	20
Nacher, Ed	Madison	Edwardsville	" 19	20
Olmstead, M. M	Macoupin	Shipman	" 14	20
Ogle, David	St. Clair	Birkner	" 19	20
Olmstead, C. M	Macoupin	Shipman	"	20
Owen, A. L	Fulton	Cuba	"	20
Omer, Daniel	Adams	Camp Point	"	20
Opel, J. F	Madison	Carpenter	" 20	20
Opel, O	"	"	" 28	20
Orendorf, D. W	Tazewell	Hopedale	" 29	20
Price, J. S	Adams	Burton	" 15	20
Park, Harlow	Cumberland	Greenup	"	20
Powell, H. K	Adams	Quincy	"	20
Pape, P. J	Franklin	Benton	" 16	20
Pearson, G. C	Vermilion	Danville	"	20
Patrick, John	Macoupin	Bunker Hill	" 19	20
Plagge, H. F	Lake	Northfield	"	20
Pierce, J. F	Mason	Topeka	" 20	20
Perry, Wm	Pike	Milton	"	20
Peak, S. W	Scott	Winchester	"	20
Perry, G. H	Jefferson	Watkinson	" 23	20
Pierce, Jno. O	Macoupin	Bunker Hill	" 28	20
Richard, P. M	Effingham	Teutopolis	" 14	20
Ruff, Henry	Adams	Quincy	" 15	20
Ruff, A. E	"	"	"	20
Ruff, Casper	"	"	"	20



PIKE PERCH.

Carp Distribution—Continued.

Name.	County.	Residence,	Date of Shipm't.	No.
Royer, Peter	Schuyler	Baders	Nov. 20	20
Ratkin, Jos	Warren	Swan Creek	"	20
Rice, T. J	Perry	Tamaroa	" 19	20
Robbins, Dan'l	Adams	Payson	" 27	20
Robbins, D. (for neighbor)	"	"	"	20
Race, C. F	Cook	Chicago	"	20
Strickle, A. B	McDonough	Macomb	" 13	20
Shinn, M. J	Pike	Atlas	"	20
Shinn, M.	"	Pittsfield	"	20
Shinn, Wm	"	"	"	20
Shinn, A	"	Atlas	"	20
Slack, A	Adams	Liberty	" 15	20
Seamus, J. W	Cumberland	Toledo	"	20
Schmalhausen, L. B	Lawrence	Bridgeport	"	20
Schmalhausen, E	"	"	"	20
Seibold, F	Marshall	Sparland	"	20
Stanbury, Sam'l	Vermilion	Danville	"	20
Shinn, Wm. D	Pike	Pittsfield	"	20
Simonds, W. B	Iroquois	Iroquois	" 16	20
Serandett, C. S	Greene	Rockbridge	"	20
Sanford, Wash	Clark	Casey	"	20
Stolberg, J. M	St Clair	elleville	"	20
Savage, Jno	Hamilton	McLeansboro	" 17	20
Shulze, H. & Bro	Washington	Okawville	"	20
Shulz Mill Co	"	"	"	20
Schulze, C. L	"	"	"	20
Shulze, George	"	"	"	20
Schmidt, Wm	Adams	Ellington	" 19	20
Smith, Tom	Will	Beecher	"	20
Smithermann, L. F	Pike	Milton	"	20
Smith, C. L	Champaign	Champaign	" 20	20
Stoker, E. S	Marion	Centralia	"	20
Spiers, Hugh	Macoupin	Bunker Hill	"	20
Schafer, P	St. Clair	Belleville	" 22	20
Schick, D. L	Lawrence	Sumner	"	20
Swartz, M	Champaign	Urbana	" 23	20
Sullivan, Jno. H	Vermilion	Danville	" 24	20
Snodgrass, A	McDonough	Bushnell	" 26	20
Sonny, Chas	Shelby	Sigel	" 27	20
Smith, Vincent	Macoupin	Bunker Hill	" 28	20
Shaw, Geo. W	Pike	Barry	"	20
Smith, J. A	McDonough	Sciota	" 29	20
Smith, F	Perry	Pinckneyville	"	20
Seiffert, Jno	Washington	kawville	" 30	20
Shulze, Aug	"	"	"	20
Shulze, Hy	"	"	"	20
Smith, Wm	"	Ashley	Dec. 1	20
Sargent, C. M	Shelby	Windsor	"	20
Sargent, W. R	"	"	"	20
Sargent, C. V	"	"	" 3	20
Tull E. D	Shelby	Okaw	Nov. 13	20
Twiggs, S. R	Peoria	Elmwood	" 14	20
Trainor, Wm	Adams	Quincy	" 15	20
Thayer, J. A	Knox	Woodhull	"	20
Thompson, R. H	Will	Beecher	" 19	20
Thompson, J. C	Adams	Quincy	"	20
Tippey, Silas E	Clark	asey	"	20
Tanner, Jno. R	Clay	Louisville	" 20	20
Thomas, W. B	Hancock	Augusta	"	20
Trulsin, Jno	Bureau	Princeton	" 23	20
Tubbs, W. C	Henderson	Kirkwood	" 27	20
Tackett, Jno. A	Shelby	Shelbyville	" 30	20
Weir Plow Co	Warren	Monmouth	" 13	20
Whimans, Thos	Douglas	Arcola	" 14	20
Wolf, Levi	Hancock	West Point	"	20
Williams, W. G	Adams	Quincy	" 15	20
Walker, A. W	Jasper	Newton	"	20
Watrous, I. S	McHenry	Ridgefield	" 16	20
Wilder, Jno. W	Will	Monee	"	20
Weiser, P	Christian	Stonington	" 17	20
Wall, Geo. W	Perry	DuQuoin	"	20
Watt, Jas	Randolph	Tilden	"	20
Wilson, P. E	Sangamon	Springfield	"	20
Wilson, Edw. A	"	"	"	20

Carp Distribution—Continued.

Name.	County.	Residence.	Date of Shipm't.	No.
Wheeler, —	Adams	Liberty	Nov. 17	20
Wever, N.	Henderson	Kirkwood	" 19	20
Weaver, Geo. W.	"	"	"	20
Weaver, Jno. W.	"	"	"	20
Wood, Jas	Macoupin	Bunker Hill	"	20
Wilson, Thos.	Tazewell	Mackinaw	" 20	20
Wickoff, T. H	Jasper	Falmouth	"	20
Western Brewing Co	St. Clair	Belleville	" 22	20
Wells, Joseph	Washington	Addieville	" 24	20
Ward, Frank	Knox	Altona	" 27	20
Ward, J. O	Hancock	West Point	"	20
Wiggins, N. B	Sangamon	Springfield	"	20
Wike, Scott	Pike	New Canton	" 28	20
Wilson, Wm	Kane	Elgin	Dec. 4	20
Yeargain, M. M	Adams	Colman	Nov. 15	20
Yurk, David	Macoupin	Bunker Hill	" 22	20
Zink, H. P	Peoria	Peoria	" 24	20

Carp Distribution by S. P. McDole, for November and December.

J. Stinger	DuPage	Naperville		20
W. Egermann	"	"		20
Lewis Bapist	"	"		20
Jas. Eggerman	"	"		20
J. Thomas	LaSalle	Ottawa		20
G. W. Blake	"	"		20
Lewis Lynch	"	"		20
Cyrus Calkins	Knox	Sugar Grove		20
Silas Michels	"	"		20
Chas. Calkins	"	"		20
C. O. Lonnicker	Ogle	Rochelle		20
Wilhelm Sebrea	DeKalb	Hinkley		20
W. Truman	LaSalle	Mendota		20
J. P. Richardson	Bureau	Princeton		20
E. C. Richardson	"	Ohio		20
A. N. Richardson	"	"		20
C. Heausman	Clinton	Lost Creek		20
J. C. Kessler	Bureau	Ohio		20
N. S. Carlisle	Kane	Geneva		20
Chas. Pope	"	"		20
A. Fredinhager	"	St. Charles		20
E. Warne	"	Blackberry		20
Chas. Miller	"	St. Charles		20
Cyrus McDole	Menard	Petersburg		20
Cyrus McDole	"	"		20
Cyrus McDole	"	"		20
Cyrus McDole	"	"		20
Cyrus McDole	"	"		20
Cyrus McDole	"	"		20
Cyrus McDole	"	"		20
C. Elmwood	DeKalb	Sycamore		20
Reuben Elwood	"	"		20
F. Woodman	Kane	Blackberry		20
F. C. McClure	"	Elgin		20
H. B. Douglas	"	Aurora		20
Dr. Thos. Hoffman	Cook	Norwood Park		20
D. H. K. Campbell	"	Lake View		20
Geo. Whitbold	"	"		20
R. Schlesser	"	Chicago		20
H. D. Evesers	Cook	Norwood Park		20
T. Thompson	"	"		20
R. L. Race	"	Irving Park		20
L. Porter	Will	Channahon		20
Jos Barnes	LaSalle	Ottawa		20
S. B. Morrell	Moultrie	Sullivan		20
J. Uptnore	Effingham	Teutopolis		20
E. G. Thompson	"	Tonica		20
Robt. Zemple	Iroquois	Woodland		20
Conrad Tague	"	"		20
B. Nessbaum	Cook	Mattison		20
Seiner	Effingham	Teutopolis		20

Carp Distribution—Continued.

Name.	County.	Residence.	Date of Shipm't.	No.
Jos. Jackson	Kendall	Millington		20
Wm. Truman	LaSalle			20
A. P. Anderson	Bureau			20
S. P. Watson	Henry	Geneseo		20
J. W. Osgood	Cook			20
A. W. Griffith	LaSalle	Farm Ridge		20
G. W. Brown	Knox	Galesburg		20
Jas. Harris	Bureau			20
M. M. Wilcoxen	Fulton	Bryant		20
Moses Hill	DeKalb	Cortland		20
Frank Jacobs	Champaign	Urbana		20
E. D. Richardson	Henry	Cambridge		20
R. G. Petten	Warren	Monmouth		20
W. F. Mitchell	Ogle	Adeline		20
Jas. Calder	Livingston	Cornell		20
H. B. Wind	LaSalle			20
Levi Colburn	Clay	Louisville		20
Peter Bresster	Whiteside	Sterling		20
J. A. Thayer	Henry	Woodhull		20
Brownell	LaSalle	Ottawa		20
Louis Stewart	Kendall	Plano		20
Louis Stewart	"	"		20
W. Pepper	Mercer	Joy		20
E. West	Kane	Blackberry		20
W. P. West	"	"		20
R. C. Strawn	LaSalle	Ottawa		20
E. Blodgett	Cook	Downer's Grove		20
F. Jacobs	Ogle	Adeline		20
A. C. Moore	"	Polo		20
L. L Hiatt	DuPage	Wheaton		20
L. L Hiatt	"	"		20
L. L. Hiatt	"	"		20
L. L. Hiatt	"	"		20
L. L. Hiatt	"	"		20
L. L. Hiatt	"	"		20
Wm. Wilhelms	Stephenson	Florence Station		20
Dirk Eilders	"	" "		20
L. Daniels	"	" "		20
D. J. Hosting	Kane	Aurora		20
J. L. Dills	DuPage	Naperville		20
J. N. Murray	"	"		20
E. Robinson	"	"		20
Wm. Clancy	Kane	Aurora		20

Carp Distribution by S. P. Bartlett, Commissioner.

E. S. Robertson	Jackson	Carbondale	Nov. 19	15	½ acres.	6	ft.
Enoch J. Steward	Richland	Claremont	"	15	½ "	3	"
Benj. D. Fowler	"	"	"	15	½ "	3	"
A. W. Fritchley	"	"	"	15	½ "	3	"
N. B. Allen	"	"	"	15	½ "	3	"
A. J. Bailey	Peoria	Peoria	"	15	½ "	3	"
B. L. T. Bourland	"	"	"	15	½ "	3	"
W. G. Wilkins	McDonough	Adair	"	15	1 "	3	"
J. C. Carr	Grundy	Morris	"	15	¾ "	3	"
C. M. Young	Warren	Monmouth	"	15	¼ "	4½	"
S. H. Callaway	Henry	Orion	"	15	½ "	2	"
M. M. Miller	Peoria	Peoria	"	15	20 "	3	"
I. N. Seamens	Cumberland	Bradburg	"	15	¾ "	4	"
J. E Hugo Herman	Shelby	Sigel	"	15	¼ "	5	"
A. S. Smart	Madison	Troy	"	15	½ "	3	"
Geo. W. Anderson	"	"	"	15	1 "	2	"
Jos. Niswauger	Logan	Atlanta	"	15	¼ "	4	"
A. J. Holderman	Grundy	Morris	"	15	½ "	3½	"
J. L. McNeil	Richland	Parkersburg	"	15	1¼ "	3	"
J. M. Davis	Macoupin	Staunton	"	15	¼ "	6	"
Hy Fairfield	Jasper	Newton	"	15	½ "	4	"
Austin Smith	"	"	"	15	½ "	4	"
Henry Kibler	"	"	"	15	½ "	4	"
Oliver Britton	"	"	"	15	½ "	4	"
F. A Kibler	"	"	"	15	½ "	4	"
C. B. McKinney	Montgomery	Irving	"	15	¼ "	6	"
H. M. Kelley	"	"	"	15	⅛ "	4	"

Carp Distribution—Continued

Name.	County.	Residence.	Date of Shipm't	No.	Area of Pond.	Depth.
Chas. Perring	Macoupin	Macoupin	Nov. 19	15	¼ acres.	3½ ft.
L. B. Corbin	"	"	"	15	½ "	3½ "
T. J. Middlecoff	Montgomery	Nokomis	"	15	½ "	4 "
Jno. Snyder	Woodford	Metamora	"	15	¾ "	6 "
M. A. Shepard	St. Clair	Lebanon	"	15	¼ "	5 "
Jno. C. Behrens	St. Clair	O'Fallon	"	15	1 "	6 "
J. W. River	Peoria	Elmwood	"	15	¾ "	5 "
S. S. Will	Hancock	Stillwell	"	15	¼ "	4 "
B. J. Manifeld	"	Dallas	"	15	¼ "	5 "
Mrs. I. H. Hufman	"	Stillwell	"	15	¾ "	5½ "
E. S. Huffman	"	"	"	15	¾ "	5 "
Wm. Wheeler	Macoupin	Carlinville	"	15	2 "	7 "
M. M. Martin	Boone	Caledonia	"	15	3 "	3 "
S. J. Briggs	Tazewell	Minier	"	15	⅛ "	3½ "
J L. Briggs	"	"	"	15	⅛ "	3½ "
J. B. McHose	Henry	Orion	"	15	⅛ "	2 "
Wm. Siering	Washington	Venedy	"	15	1-5 "	6 "
Chas. Rudolph	"	"	"	15	½ "	5 "
F. Wiegmann	"	"	"	15	¼ "	4 "
F. A. Blume	"	"	"	15	¼ "	4½ "
G. Schneider	"	"	"	15	½ "	5½ "
F. Seiving	"	"	"	15	¼ "	4 "
F. W. Kastrup	"	"	"	15	1 "	5 "
E. W. Miller	Montgomery	Raymond	"	15	¼ "	10 "
W. E. Killam	Shelby	Tower Hill	"	15		
Geo. Zeigler	Crawford	Oblong	"	15	1 acres.	5 ft.
J. R. Beck	Christian	Assumption	"	15		
Malinda McClure	Shelby	"	"	15	½ acres.	2½ ft.
Thos. D. Fox	St. Clair	Freeburg	"	15	½ "	3 "
F. A. Wildeman	"	"	"	15	¾ "	3 "
F. Bruehmueller	Jefferson	Bell Rive	"	15	⅛ "	5 "
Geo. E. Krautzer	McDonough	Colchester	"	15		10 "
Geo. Krysher	Jackson	Makanda	"	15		
A. M. Champ	McDonough	Colchester	"	15	5 acres.	4 ft.
D. Headon	Hancock	La Harpe	"	15	¼ "	3 "
Geo. Coulson	"	"	"	15	½ "	4 "
W. E. Coquillette	"	"	"	16	¾ "	4½ "
Wm. A. Glotfielder	Tazewell	Minier	"	15	½ "	4 "
Elijah Wright	Montgomery	Chapman	"	15	½ "	5 "
Jno. W. Latta	Cumberland	Greenup	"	15		
Jas. Calder	Livingston	Cornell	"	15	½ acres.	4 ft.
David Calder	"	"	"	15	½ "	4 "
H. H. Gunn	Vermilion	Muncie	"	15	⅛ "	2 "
W. J. Meyer	Livingston	Ocoya	"	15	1-16 "	2 "
A. A. Short	Randolph	Perry	"	15	1¾ "	5 "
R. Bush	Boone	Mt. Sterling	"	15	½ "	3 "
P. T. Bush	"	" "	"	15		4 "
Peter Rigg	"	" "	"	15	⅛ acres.	4 "
J. A. Smith	McDonough	Scotia	"	15	¼ "	3 "
Hy J. Davis	La Salle	Freedom	"	15		
Homer Wattles	McHenry	West McHenry	"	15	1 acres.	2 ft.
A. J. Pilchford	Washington	Irvington	"	15	½ "	2½ "
Wm. Thompson	Effingham	Effingham	"	15	½ "	5 "
D. Heaton	Scott	Manchester	"	15	¼ "	4 "
A. J. Famelle	Greene	Carrollton	"	15	¼ "	4 "
Jno. M. Lewis	"	"	"	15		
J. P. Blakeley	Henry	Orion	"	15	½ acres.	3 ft.
Morris Kane	Iroquois	Watseka	"	20	6 "	5 "
C. Bigler	Shelby	Sigel	"	15	1-5 "	4 "
A. C. McMurphy	Jackson	Makanda	"	15	1 "	5 "
Henry Mahannah	Macon	Casner	"	15	1-10 "	4 "
John Peyson	Hancock	LaHarpe	"	15		
A. Allison	McDonough	Good Hope	"	15	¼ acres.	5 ft.
Jas. Taylor	Brown	Mound Station	"	15	¼ "	5 "
Henry Conklin	Hancock	Carthage	"	15	¾ "	5 "
J. S. Coffman	Christian	Taylorville	"	15	1½ "	7 "
F. Guseking	Effingham	Shumway	"	15	½ "	4 "
L. J. Kuntz	St. Clair	Belleville	"	15	2 "	6 "
Wm. Winkleman	"	"	"	15	½ "	6 "
Lewis Burson	Marshall	Sparland	"	15	¼ "	4 "
Geo. Davis	Adams	Mendon	"	15	¼ "	5 "
C. A. Bonvallet	Kankakee	St. Anne	"	15	1-10 "	4 "
S. Snyder	"	Metamora	"	15		
Jno. M. Bolt	Macoupin	Brighton	"	15		
Hy Ball	Jersey	"	"	15	¾ acres.	6 ft.
G. W. Fink	Sangamon	Pleasant Plains	"	15	¾ "	6 "
Jno. N. Harrison	"	Salisbury	"	15		

Carp Distribution—Continued.

Name.	County.	Residence.	Date of Shipm't.	No.	Area of Pond.	Avg. depth.
C. F. Griffith	McDonough	Macomb	Nov. 19	15	½ acres.	6 ft.
W. S. Hendricks	Hancock	St. Marys	"	15	⅞ "	5 "
M. Dappart	Shelby	Stewardson	"	15	1 "	3½ "
Henry Mills	Vermilion	Georgetown	"	15	½ "	4 "
Joshua Hedgecock	Schuyler	Plymouth	"	15	1 "	2 "
M. L. McClure	McLean	Danvers	"	15	¾ "	3 "
Geo. W. Westlake	Pike	Pittsfield	"	15		
Arthur Brown	"	"	"	15	1½ acres.	4½ ft.
B. F. Westlake	"	"	"	15	1½ "	4½ "
Reuben Allen	"	"	"	15	1½ "	4½ "
C. F. Westlake	"	"	"	15	1½ "	4½ "
Geo. W. Westlake	"	"	"	15	1½ "	4½ "
J. B. Wright	Lawrence	Sumner	"	15	1-5 "	4 "
A. G. Barnes	Christian	Taylorville	"	15	¼ "	4 "
Ben Barnes	"	"	"	15	¼ "	4 "
Jno. S. Pumyea, Sr.	Fulton	Fairview	"	15	⅓ "	2½ "
Wm. Perry	Pike	Milton	"	15		
C. L. Pfauschmidt	"	Barry	"	15	½ acres.	6 ft.
L. B. Clark	Hancock	Elvaston	"	15	⅔ "	3 "
Thos. Buck	Grundy	Saratoga	"	15	1 "	2 "
A. G. Preston	Carroll	Mt. Carroll	"	15	1 "	6 "
H. P. Edmuns	Ogle	Carthage	"	15	¼ "	5 "
Jacob Strous	Lawrence	Sumner	"	15	¾ "	8 "
C. W. Redmon	Edgar	Paris	"	15	3½ "	3 "
Wm. J. Zimmerman	Montgomery	Harvel	"	15		
Wade J. Zimmerman	"	"	"	15		
Edw'd Zimmerman	"	"	"	15		
Fred Zimmerman	"	"	"	15		
B. L. Cunningham	Lawrence	Sumner	"	15	1-5 acres.	4 ft.
A. M. McClain	White	Enfield	"	15	1-5 "	3 "
O. W. Gray	Richland	Noble	"	15	¾ "	3 "
S. P. Hovey	Champaign	Ogden	"	15	1 "	2 "
W. Basthke	DuPage	Utopia	"	15	¾ "	4 "
Arthur Robinson	"	"	"	15	¾ "	4 "
Fritz Meyer	"	"	"	15	¾ "	4 "
S. B. Bowman	Jasper	Hunt City	"	15	1½ "	3 "
Jno. Bates	"	"	"	15		
S. N. Jennings	Brown	Mound Station	"	15	¾ acres.	7 ft.
T. J. Howell	Henry	Woodhull	"	15	½ "	3 "
W. W. Warner	"	Warner Station	"	15	½ "	8 "
Jas. Harris, Jr.	Bureau	Princeton	"	15	½ "	4 "
Henry Seiter	St. Clair	Lebanon	"	15	½ "	6 "
F. W. Cox	Lawrence	Bridgeport	"	15	¼ "	4 "
F. W. Henry	Shelby	Windsor	"	15	1-10 "	5½ "
Jas. Burke	Jersey	Brighton	"	15	2½ "	9 "
Jno. B. Fox	Cook	Blue Island	"	15	½ "	4 "
C. A. Chittenden	Adams	Mendon	"	15	¼ "	5 "
John M. Bolt	Jersey	Brighton	"	15	½ "	8 "
R. R. Bourland	Peoria	Peoria	"	15	½ "	3 "
R. N. Bailey	"	"	"	15	¼ "	2 "
Henry Benig	St. Clair	Smithton	"	15	⅓ "	5 "
Thos. Buck	Grundy	Morris	"	15		
W. W. Brown	Peoria	Elmwood	Nov. 20	15	1½ acres.	3 ft.
D. H. Gray	"	"	"	15	1½ "	3 "
C. F. Bowers	"	"	"	15	1½ "	3 "
E. Vanpatten	"	"	"	15	1½ "	3 "
S. S. Graham	"	"	"	15	1½ "	3 "
Scott Clingham	"	"	"	15	1½ "	3 "
W. W. Brown	"	"	"	15	1½ "	3 "
S. E. Ellis	"	"	"	15	1½ "	3 "
F. S. Camp	"	"	"	15	1½ "	3 "
C. J. Bird	"	"	"	15	1½ "	3 "
Thos. Gowery	Hancock	Loraine	"	15		
D. W. Ewing	Coles	Mattoon	"	15	½ acres.	3 ft.
Geo. Schaefer	McDonough	Bushnell	"	15		
Chas. D. Durham	Vermilion	Danville	"	15	½ acres.	15 ft.
A. C. Daniel	"	"	"	15	½ "	15 "
Samuel Beecher	Whiteside	Coleta	"	15	15 "	2 "
S. S. Cobb	"	"	"	15	15 "	2 "
G. W. Howe	"	"	"	15	15 "	2 "
J. S. Deits	"	"	"	15	15 "	2 "
H. Hawkins	"	"	"	15	15 "	2 "
W. C. Vincent	"	"	"	15	15 "	2 "
F. W. Weddell	"	"	"	15	15 "	2 "
Frank Bronson	"	"	"	15	15 "	2 "
Byron London	"	"	"	15	15 "	2 "
Jas. McDonald	Madison	Bethalto	"	15	2¾ "	12 "
F. W. L. Beek	"	"	"	15	2 "	15 "

Carp Distribution—Continued.

Name.	County.	Residence.	Date of Shipm't.	No.	Area of Pond.	Depth.
Patrick Conley	Madison	Bethalto	Nov. 20	15	2¾ acres	12 ft.
H. O. Webber	"	"	"	15	3 "	10 "
Wm. Benbow	"	"	"	15	3 "	10 "
Wm. Meisler	"	"	"	15		
B. B. Ingerham	Clay	Flora	"	15	1 acres	4 ft.
L. E. Boyer	Stephenson	Waddams Grove.	"	15	1-5 "	4 "
A. L. Balman	Jasper	Wheeler	"	15	1 "	4 "
Geo. Marcher	"	"	"	15	½ "	3 "
P. A. Brady	Cumberland	Greenup	"	15		
E. E. Spencer	Marion	Alma	"	15		
Frank Jennings	Ford	Gibson	"	15	1 acres	3 ft.
Andrew Stollberg	St. Clair	Heinrichtown	"	15	3 "	5 "
Jno. P. Stollberg	"	"	"	15	3 "	5 "
Martin J. Stollberg	"	"	"	15	3 "	5 "
Henry C. Stollberg	"	"	"	15	3 "	5 "
Jno. M. Stollberg	"	"	"	15	3 "	5 "
Geo. Stollberg	"	"	"	15	3 "	5 "
J. H. Bourns	Cook	Park Ridge	"	15	½ "	6 "
Jas. W. Greenwood	Iroquois	Loda	"	15		
W. C. Caldwell	Sangamon	Loami	"	15	1 acres	4 ft.
J. F. Miller	"	Auburn	"	15	¼ "	5 "
W. E. Lodge	Piatt	Lodge Station	"	15		
J. F. Compton	Jasper	Boos Station	"	15	½ acres	6 ft.
B. E. Whitlock	"	Henrick	"	15		
J. C. Whitlock	"	"	"	15		
Edward Cox	Fulton	Fairview	"	15	¼ acres	3 ft.
F. M. Taggart	Schuyler	Wayland	"	15		
Hon. D.C. Taylor	Kankakee	Kankakee	"	15	3 acres	12 ft.
R. N. Matheny	Cumberland	Greenup	"	15		
Jacob Dickens	Kane	Anrora	"	15		
Rev. T. Larson	McHenry	Harmony	"	15		
H. Wakening	St. Clair	Lenzburg	"	15	1 acres	10 ft.
W. R. Decker	Vermilion	Sumner	"	15		
John S. Jones	Jasper	Advance Station	"	15		
Julius Kuntz	St. Clair	Belleville	"	15	¼ acres	4 ft.
S. M. Sebkweches	"	"	"	15		
R. Poindexter	Franklin	Thompsonville	"	15	¼ acres	4½ ft.
W. B. Tribe	Edwards	Albion	"	15	⅛ "	3 "
Patrick Nicholson	Coles	Lerna	"	15	1-10 "	2 "
Ernst Herrecke	LaSalle	LaSalle	"	15	½ "	6 "
Chas. Herbold	"	"	"	15		
Jno. Groves	Logan	Atlanta	"	15	½ acres	4 ft.
C. W. Wellington	Schuyler	Rushville	"	15	1 "	4 "
J. R. Challacombe	Montgomery	Hillsboro	"	15	½ "	3 "
Alex A. Cress	"	"	"	15		
William Laws	"	Donnellson	"	15	¾ acres	12 ft.
Chas. A. Ramsey	"	Hillsboro	"	15		
Jacob Specht	Clinton	Trenton	"	15	2 acres	7 "
S. L. Dickerson	Jasper	West Liberty	"	15	½ "	3 "
J. G. Willsby	Pike	Pittsfield	"	15	1 "	7 "
W. R. Willsby	"	"	"	15	1 "	7 "
T. Kaltrieder	"	"	"	15	½ "	5 "
J. M. Truitt	Montgomery	Hillsboro	"	15	1 "	7 "
J. M. Doran	Pike	Barry	"	15		
W. J. Kellam	Jasper	West Liberty	"	15	¾ acres	4 ft.
Jno. Kesler	Vermilion	Humerick	"	15		
Jacob Jaret	"	"	"	15		
E. T. Stokes	"	"	"	15		
C. Lillerick & Sons	Henderson	Gladstone	"	15	¾ acres	7 ft.
Lemuel McColm	Marion	Salem	"	15	¼ "	4 "
Chas. Retterer	McHenry	Dorr	"	15	2 "	5 "
A. V. Lisnby	DeWitt	Clinton	"	15		
Egypt Milling Co	Washington	Ashley	"	15	½ acres	7 ft.
Jas. M. Handley	Vermilion	Humerick	"	15		
E. R. E. Kimbrough	"	Danville	"	15		
Jacob Randall	Washington	Okawville	"	15	⅛ acres	5 ft.
Adam Randall	"	"	"	15	⅛ "	5 "
Wm. Randall	"	"	"	15	⅛ "	5 "
Edw. Randall	"	"	"	15	⅛ "	5 "
Julius Neubauer	"	"	"	15	⅛ "	5 "
H. A. Grimmer	Adams	Quincy	"	15	½ "	4 "
S. Price	Crawford	Hardinsville	Nov. 21	15	½ "	5 "
John B. Shott	Adams	Quincy	"	15		
Mrs. J. B. Shott	"	"	"	15		
E. H. Waldron	Tippecanoe	Lafayette, Ind	"	15	⅛ acres	4 ft.
R. Roberts	Boone	Belvidere	"	15		
F. Amen	Adams	Clayton	"	15		

Carp Distribution—Continued.

Name.	County.	Residence.	Date of Shipm't.	No.	Area of Pond.	Depth.
C. M. Burgess	Piatt	Bement	Nov. 21	15		
W. W. Barr	Jackson	Carbondale	"	15	1 acres	4 ft.
Jas. Brainard	Bureau	Buda	"	15	2 "	4 "
Sam'l Black	Vermilion	Fithian	"	15	⅛ "	2 "
Jerry Burtz	"	"	"	15		
Jno. R. Thompson	"	"	"	15		
Jno. R. Crowe	Monroe	Waterloo	"	15		
S. G. Chamness	Lawrence	Centerville	"	15		
W. O. Converse	Sangamon	Springfield	"	15		
H. H. Crane	Morgan	Liter	"	15	2½ acres	4 ft.
Geo. W. Colburn	Clay	Ingraham	"	15		
C. C. Colburn	"	"	"	15		
Geo. Marley	"	"	"	15		
S. M. Colburn	"	"	"	15		
Sam'l Cook	Macoupin	Carlinville	"	15		
Geo. Carey	Lee	Rochelle	"	15	1 acres	2 ft.
B. V. Carey	Crawford	Robinson	"	15	⅛ "	3 "
M. J. Dobshultz	St. Clair	Belleville	"	15	1 "	6 "
Cyrus DeBolt	LaSalle	Ottawa	"	15	¼ "	4 "
N. T. Eakin	Jackson	Ora	"	15		
H. A. Edson	Jasper	Willow Hill	"	15	¼ acres	4 ft.
Hon. Milo Erwin	Williams	Marion	"	15		
V. E. Elmore	Cass	Ashland	"	15	½ acres	9 ft.
Elijah D. Gwinn	Hancock	Loraine	"	15	1 "	
T. L. Gilbert	Knox	Knoxville	"	15	½ "	3 ft.
C. H. Gardner	Peoria	Elmwood	"	15		
Jas. Gaines	Vermilion	Ridge Farm	"	15		
G. W. Gaines	"	"	"	15		
Grace Buss	"	"	"	15		
Jno. W. Gross	Stark	Rochester	"	15	2 acres	7 ft.
J. D. Hilliard	Jefferson	Mt. Vernon	"	15	1 "	6 "
Geo. Hackethal	Madison	Nameoki	"	15		
Jno. T. Hewitt	Vermilion	Georgetown	"	15	¼ acres	4 ft.
J. G. Henkley	Pike	Baylis	"	15		
Chas. Hersman	Sangamon	Loami	"	15		
E. Hensinger	White	Burnt Prairie	"	15		
T. H Hinekle	St. Clair	Caseyville	"	15	⅛ acres	4 ft.
Jno. Hinekle	"	"	"	15	¼ "	3 "
Jno. Hugely	Washington	Nashville	"	15	1 "	5 "
G. B. Hicks	Crawford	Hardinsville	"	15	1 "	6 "
Ezra Hinshaw	McLean	Bloomington	"	15	½ "	5 "
N. B. Heafer	"	"	"	15	10 "	8 "
G. W. Harbaugh	Monroe	Foster Pond	"	15	½ acres.	3 ft.
D. H. Hart	Christian	Pana	"	15		
W. H. Heaton	Mercer	Keithsburg	"	15	⅛ acres.	4 ft.
J. P. Hodge	Pope	Golconda	"	15	6 "	3 "
Peter Jacobs	Marshall	Sparland	"	15		
S. S. B. Johnson	Moultrie	Sullivan	"	15		
Mrs. E. Kugler	Kendall	Millbrook	"	15		
H. H King	Hancock	Augusta	"	15		
Peter S. Nelson	Knox	Henderson	"	15	½ acres.	6 ft.
Edwin Nelson	"	"	"	15	½ "	6 "
George Nelson	"	"	"	15	½ "	6 "
W. Johnson	"	"	"	15	⅓ "	7 "
Lewis Johnson	"	"	"	15	⅓ "	7 "
H. S. Kiner	Henry	Geneseo	"	15	1¼ "	2½ "
Conrad Long	St. Clair	Freeburg	"	15	½ "	2½ "
Thos. Liggett	Massac	Metropolis	"	15	1-10acre.	6 ft.
Jas. A. McIlvaine	Randolph	Sparta	"	15		
H. M. Marks	McHenry	Huntley Grove	"	15		
J. F. Monday	Logan	Lincoln	"	15		
J. J. Morris	Will	Marley	"	15		
S. T. Straitan	Jefferson	Mt. Vernon	"	15	1 acres.	6 ft.
B. W. Straitan	"	"	"	15	1 "	6 "
C. W. Pavey	"	"	"	15	½ "	2 "
J. B. McNair	Jasper	Willow Hill	"	15	¾ "	2½ "
J. N. McElvain	Macoupin	Nilwood	"	15	1 "	6 "
Jno. McCleery	Pike	Baylis	"	15	¾ "	5 "
Peter Maller	Monroe	Waterloo	" 24	15		
Milton Newlin	Vermilion	Georgetown	"	15		
Wm Needham	Cumberland	Neoga	"	15		
F. M. Newman	Washington	Beaucoup	"	15		
Wm. L. North	Lee	May	"	15	⅛ acres.	2 ft.
H. H. Oberschelp	Bureau	Princeton	"	15		
F. Oswald	Madison	Alhambra	"	15		
Jno. Price	Crawford	Oblong	"	15		
Geo. Zeigler	"	"	"	15	1 acres.	5 ft.

Carp Distribution—Continued.

Name.	County.	Residence.	Date of Shipm't.	No.	Area of Pond.	Depth.
J. C. Robinson	Clark	Westfield	Nov. 24	15		
Jno. P. Roswell	Macoupin	Bunker Hill	"	45		
P. H. Reither	Washington	Nashville	"	15	1⅓ acres.	3 ft.
Glenn Bros	Montgomery	Hillsboro	"	15	1½ "	18 "
C. Rohrbough	Marion	Kinmundy	"	15	¼ "	8 "
John I. Spencer	Hancock	Hamilton	"	15		
Sawyer & McCracken.	Washington	Nashville	"	15	3 acres.	4 ft.
M. Swartz	Champaign	Urbana	"	15	¼ "	4 "
J. Sees	McLean	Bloomington	"	15	1-16"	5 "
J. W. W. Sherman	Kane	DesPlains	"	15		
H. H. Oberschelp	Bureau	Princeton	"	15	⅜ acres.	5½ ft.
W. N. Stewart	Jasper	Latona	"	15	½ "	5 "
Alex. Smith	"	Newton	"	15		
H. Simmons	Fayette	Vandalia	"	15		
Edw. Talbot	Cumberland	Greenup	"	15		
Fred Trautmann, Jr	St. Clair	Caseyville	"	15	¼ acres.	2½ ft.
F. Trautmann, Sr.	"	"	"	15	⅛ "	3 "
Jno. M. Tonson	Madison	Alton	"	15	1 "	6 "
Hy. O. Tonson	"	"	"	15	½ "	7 "
Chas. Terpining	Knox	Galesburg	"	15	1 "	2 "
Chas. H. Gardner	Peoria	Elmwood	"	15	½ "	5½ "
Jno. Tunnell	Macoupin	Plainview	"	15	½ "	7 "
Simon Vandermark	Lawrence	Bridgeport	"	15	½ "	4 "
Thos. Whitson	McHenry	Woodstock	"	15		
Levi Watson	Clark	Westfield	"	15		
Jas. Wangler	Jefferson	Opdyke	"	15		
J. J. Wright	Montgomery	Chapman	"	15	½ acres.	4 ft.
A. N. Walker	Jasper	Newton	"	15		
Hon. Nathan Williams	Whiteside	Sterling	" 21	15		
A. L. Wilbers	Union	Dongola	"	15		
H. W. Magur	McDonough	Good Hope	"	15		
Isaac Woodyard	Vermilion	Ridge Farm	"	15		
Geo. P. Willey & Son	DuQuoin	Perry	" 24	15	½ acres.	4 ft.
Saml. White	Clay	Flora	"	15	¼ "	6 "
Ira Coe	Adams	Quincy	" 20	15		
J. F. Hughes	"	"	"	15		
Geo. Booth	"	"	"	15		
A. S. Williams	Vermilion	Danville	" 21	15	½ acres.	5 ft.
Louis Pregler	Cook	Chicago	"	100		
Wm. Rhode	Richland	Claremont	" 24	15	1 acres.	5 ft.
N. Loser	"	"	"	15	1 "	5 "
Geo. Lutz	"	"	"	15	1 "	5 "
R. A. Hunt	"	Olney	"	15	1 "	3 "
Wm. Harman	"	"	"	15	1 "	3 "
D. Baird	"	"	"	15	1 "	2 "
M. C. Brehm	"	Claremont	"	15	1 "	5 "
E. Bowyer	"	Noble	"	15	1-5 "	6 "
David Boatman	"	Olney	"	15		
J. W. Findley	"	Noble	"	15	¼ acres.	2 ft.
Jacob Gloss	"	Olney	"	15		
Joseph Gloss	"	"	"	15		
H. Swallen	"	Claremont	" 24	15	1 acre	5 ft.
F. Schmachel	"	"	"	15	1 "	5 "
W. J. Burgess	DuQuoin	DuQuoin	"	15	1 "	
S. D. Kemp	Peoria	Elmwood	"	15	2½ "	3 ft.
D. E. Kemp	"	"	"	15	2½ "	3 "
A. F. Rogers	Madison	Upper Alton	"	15	½ "	5 "
Geo. Waters	Rock Island	Milan	"	15	5 "	5 "
Wm. G. Wilkins	McDonough	Adair	"	15		
G. N. Wyatt	Wayne	Mt. Erie	"	15	⅞ acres	6 ft.
A. S. Williams	Vermilion	Danville	"	15		
J. H. Sedlic	Pike	Pittsfield	"	15	½ acres	5 ft.
D. F. Bair	Knox	Galesburg	"	15	½ "	4 "
N. Baldwin	Shelby	Stewart-on	"	15		
Thos. Childers	Lawrence	Pinkstaff	"	15		
Henry Bender	Clinton	Carlyle	"	15	2 acres	6 ft.
Frank Gundlach	"	"	"	15	2 "	6 "
Wm. Gunn	Vermilion	Muncie	"	15		
Henry F. Martin	Macoupin	Brighton	"	15	1 acre	6 ft.
Henry Turner	Logan	Atlanta	"	15		
Clyde Turner	"	"	"	15		
Jas. Paxton	Edgar	Kansas	"	15	1 acre	4 ft.
Oswald Jessup	Jasper	West Liberty	"	15		
S. C. Fox	Boone	Garden Prairie	"	15	¾ acre	3 ft.
R. H. Markham	Fulton	London Mills	"	15	1-5 "	2 "
Wm. Muir	Randolph	Steeleville	" 24	15		
F. Luhr	"	"	"	15		

Carp Distribution—Continued.

Name.	County.	Residence.	Date of Shipm't.	No.	Area of Pond.	Depth.
Aug. Adair	Randolph	Steeleville	Nov. 21	15		
Grigg West	Washington	Ashley	"	15		
E. P. Ashbrook	Shelby	Windsor	"	15	⅛ acre	5 ft.
Wm. Niemeyer	Macoupin	Mt. Olive	"	15	¼ "	8 "
N. Leuz	Rock Island	Aledo	"	15	1½ "	8 "
N. Troutner	Madison	Grant Fork	"	15		
Christian Tontz	"	Saline	"	15	⅛ acre	4 ft.
C. Peck	Clark	Marshall	"	15	¼ "	5 "
U. J. Pifer	"	Sullivan	"	15		
Jno. Dysart	Lee	Dixon	"	15	1 acre	3 ft.
Jno. Clair	Adams	Mendon	"	15	¼ "	5 "
Geo. Bruening	Marion	Centralia	"	200		
W. D. Finlay	Adams	Quincy	"	15	1 acre	4 ft.
F. Finlay	"	Columbus	"	15	½ "	3½ "
J. J. Meyrida	Sangamon	Pawnee	"	15		
Donty Patterson	Moultrie	Sullivan	"	15		
Chas. Stone	Kane	Aurora	"	15		
Geo. P. Rosewell	Macoupin	Bunker Hill	" 25	15		
Stewart & Walcott	Cook	Chicago	" 24	15		
C. H. Atkins	Bureau	Arlington	"	15		
Benj. Cummings	Adams	Camp Point	"	15	1 acre	15 ft.
D. H. Patton	Pike	Baylis	"	15		
G. W. Shay	Clark	Dennison	"	15	1 acre	6 ft.
Jno. Hartan	LaSalle	Mendota	"	15		
A. Fishel	Edwards	West Salem	"	15	1-10 acre	3½ "
D. Garber	Clay	Flora	"	15	¼ "	3 "
S. H. Jemeson	Sangamon	Farmingdale	"	15	⅓ "	3 "
Harry Hare	LaSalle	Ottawa	"	15	¾ "	10 "
Jas. Barnes	"	Dayton	"	15		
Rowland Giljames	"	"	"	15	¼ acre	8 ft.
J. R. Snyder	Woodford	Benson	"	15	½ "	3½ "
C. F. Hodgdon	Adams	Quincy	"	15	1 "	4 "
Thos. Brew	Pike	Pittsfield	"	15		
Thos. Longhorn	Edwards	Albion	"	15	½ acre	4½ ft.
T. L. Moss	Jefferson	Mt. Vernon	"	15	½ "	3 "
Donty Patterson	Moultrie	Sullivan	"	15	½ "	5 "
H. G. McKeby	Washington	Nashville	"	15		
Frank Thomas	Macoupin	Virden	"	15	3 acres	7 ft.
Jno. M. Eull	Adams	Quincy	"	15	1 "	4 "
Geo. B. McMamel	Kankakee	Buckingham	"	15	1½ "	3 "
F. M. Taggart	McDonough	Wayland	" 26	15	¼ acres	4 ft.
J. D. Miniger	"	Macomb	"	15	¼ "	4 "
S. T. Gibson	Mercer	New Windsor	"	15	1 "	3½ "
F. Bumann	Macoupin	Bunker Hill	"	15	¾ "	7 "
Aug. Stoldt	"	"	"	15	¾ "	7 "
Wm. Sharo	Pike	Pittsfield	"	15		
A. W. Griffith	LaSalle	Grand Ridge	"	15	1-16 "	4 "
James H. Smith	Madison	Moro	"	15	¼ "	2½ "
J. T. King	"	Upper Alton	"	15		
D. S. Groff	Richland	Claremont	"	15		
J. M. Pearson	Madison	Godfrey	"	15		
James Strouse	Wayne	Long Prairie	"	15		
W. J. Peters	Clinton	Carlyle	"	15		
Marion Tyffer	Wayne	Long Prairie	"	15		
S. W. Colton	Bureau	Princeton	"	30	½ acres	3 ft.
W. Bengert	Adams	Quincy	"	15	½ "	3½ "
John Bengert	"	Melrose	"	15	1 "	4½ "
J. F. Richards	"	Adams	" 27	15	1½ "	4 "
G. W. Enloch	Bureau	Princeton	"	15	½ "	3 "
Ira Coe	Adams	Melrose	"	15	1 "	4 "
Geo. Booth	"	Adams	"	15	½ "	3 "
J. F. Hughes	"	"	"	15	1 "	4½ "
Thos. Brown	Richland	Parkersburg	"	15	1 "	
L. B. Barton	Saline	Raleigh	"	15		
A. S. Williams	Vermilion	Danville	"	15	⅛ acres.	5 ft.
D. M. Snyder	Knox	Abingdon	"	15		
T. W. Hall	Saline	Gallatia	"	15		
Harrison Cook	Clark	Marshall	"	15	¼ acres.	2½ ft.
Benj. Weaver	Vermilion	Danville	"	15		
Wm. L. Ayer	Jefferson	Centralia	"	15		
J. H. Paullin	Logan	Atlanta	"	15	⅓ acres.	4 ft.
A. W. Ladd	LaSalle	Dayton	"	15		
Wm. Ribbe	"	"	"	15	½ acres.	7 ft.
Louis King	Madison	New Douglas	"	15		
Fred Obst	St. Clair	Belleville	"	15		
A. Hatch	Pike	Strout	"	15	½ acres.	6 ft.
Wm. Wilson	LaSalle	Utica	"	15	2 "	3 "

Carp Distribution—Continued.

Name.	County.	Residence.	Date of Shipm't.	No.	Area of Pond.	Depth.
P. L. Johnson	Jefferson	Mt. Vernon	Nov. 27	15		
Julius Broshl	Christian	Pana	"	15	2½ acres.	8 ft.
Louis Weyman	Cook	Richton	"	15	¾ "	4 "
Isaac Detheridge	Greenwood	Fame, Kas	"	15		
J. M. Bouress	Jasper	Hidalgo	"	15		
Jas. Cardot	"	Newton	"	15		
A. Thayer	Henry	Woodhull	"	15	4 acres.	4 ft.
B. F. Combs	Richland	Olney	"	15		
Rufus Brown	McHenry	Woodstock	"	15		
A. R. Glenn	Morgan	Jacksonville	"	15	¼ acres.	3 ft.
Garin Bros	Bureau	Princeton	"	15	¼ "	4 "
S. B. Bowman	Jasper	Hunt City	"	15		
E. Hensinger	White	Burnt Prairie	"	15		
E. D. Gwinn	Hancock	Loraine	"	15		
A. M. Ryder	Knox	Abingdon	"	15		
J. P. Middlecott	Ford	Paxton	"	15	1 acres.	4 ft.
Theo. Dickrotger	Clinton	Carlyle	"	15		
Wm. Werre	Randolph	Steeleville	"	15		
Thos. Liggett	Massac	Massac Creek	"	15		
Jno. Norton	Iroquois	Cissna Park	"	15		
Jno. A. Miller	Sangamon	Salisbury	"	15		
W. A. Rothwell	Winnebago	Kiswaukee	"	15		
Geo. D. Schaffer	Shelby	Shelbyville	"	15		
Jno. Lutz	Alida	Marston	Dec. 11	15	1½ acres.	5 ft.
E. Lintz	"	"	"	15	1½ "	5 "
Lizzie Lintz	"	"	"	15	1½ "	5 "
J. J. Davis		Macon	"	15		
R. L. Hinkley	St. Clair	Belleville	" 12	15	½ acres.	8 ft.
Carl Rupke	Shelby	Sigel	"	15		
P. S. Mahoney	Jasper	Wheeler	"	15		
Ira Coe	Adams	Quincy	"	15		
V. Heinzman	Clinton	New Baden	"	15	1-5 acres	5½ ft.
Wm. Grusbaum	"	"	"	15		
Martin Mayer	Perry	Pinckneyville	"	15		
J. H. Theis & Son	Randolph	Steeleville	"	15	¼ acres.	5 ft.
Wm. Foster	Randolph	Sparta	"	15	2 "	4 "
L. D. Foltz	Effingham	Montrose	" 15	15	1-16"	4 "
H E. Wiley	Perry	Tamaroa	"	15		
E. Wiley	"	"	"	15		
J. D. Lee	"	"	"	15		
Wm. Lee	"	"	"	15		
J. Moulton	"	"	"	15		
J. Smith	"	"	"	15		
Carl Rapke	Shelby	Sigel	"	15		
H. H. King	Hancock	Augusta	"	15		
J. J. Morris		Marlow	"	15		
F. M. Newman	Washington	Ashley	"	15		
Emig & Dugger	Clinton	Trenton	"	15		
Hamilton Parkhill	Randolph	Shiloh Hill	"	15		
M. M. Rendeman	Union	Jonesboro	"	15		
J. S. Hickman	Vermilion	East Lynn	"	15		
S. H. Drehman	Bureau	Princeton	"	15		
Jas. Given	"	"	"	15		
Amos Meyer	Effingham	Montrose	"	15		

CARP DISTRIBUTED BY GOVERNMENT.

Name.	County.	Postoffice Address or Residence.
John Ott	Schuyler	Camden
W. L. Dove	Shelby	Shelbyville
O. Wilhelms	Stephenson	Florence Station
W. Wilhelms	"	"
Jno. Gardner	Vermilion	Potomac
Hy. Bowers	"	East Lynn
A. J. Stephenson	"	Ridge Farm
J. J. Troutt	Washington	Nashville
Edgar King	White	Enfield
R. A. Cowdy	"	"
J. F. Bowman	Fayette	Brownstown
A. W. Wing	"	Vandalia
J. C. Bowles	"	Hagerstown
E. Smith	"	Vandalia
Disken Proyer	"	Farmington
W. F. Motter	Ford	Gibson City
R. G. Webb	Franklin	Taylor Hill
W. O. Morgan	Fulton	Cuba
J. E. Sandusky	Hamilton	Flint
Z. S. Young	Jasper	West Liberty
Q. A. Wilbank	Jefferson	Belle Rive
Dr. O. P. Morris	Washington	Ashler
J. T. Payson	"	Wood Lawn
A. D. Gross	Bond	Greenville
C. Ketterman	Bureau	Tiskilwa
A. O. Elliott	Champaign	Homer
C. C. Steavens	"	"
J. W. Reed	"	"
J. F. White	Christian	Pana
Wm. M. Massey	Clay	Xenia
T. O. Pence	"	"
G. W. Hiatt	Cumberland	Neoga
D. A. Ward	Douglas	Camargo
Jno. McKee	Edgar	Chrisman
A. J. Mapes	"	Scott Land
A. A. Newlan	"	Cherry Point
D. A. Fouts	"	Christian
W. C. Duker	"	"
W. B. Tribbe	Edwards	Albia, Ia
Geo. Stortzum	Effingham	Montrose, Ia.
Wm. Blakely	"	Altamont
Dr. S. S. Rice	"	"
Geo. J. Zander	"	"
John Albert	Randolph	Steeleville
J. L. Lively	"	Perry
J. M. Lively	"	"
M. Haweson	"	"
Wm. F. Allevert	"	Welga
Dr. J. Keller	"	Steeleville
E. H. Norwood	Richland	Olney
A. J. Farris	"	"
D. S. Curry	"	Calhoun
A. T. Baird	"	Olney
Edward Silk	Scott	Exeter
Mrs. Sue J. Vickery	Morgan	Jacksonville
R. W. Gillam	Peoria	Chillicothe
S. D. Kemp	"	Elmwood
J. W. Ellie	Perry	DuQuoin
Thos. White	"	Cutler
W. F. Tefto	"	Conant
Geo. Ramhilt	"	Cutler
Wm. C. Davis	"	"

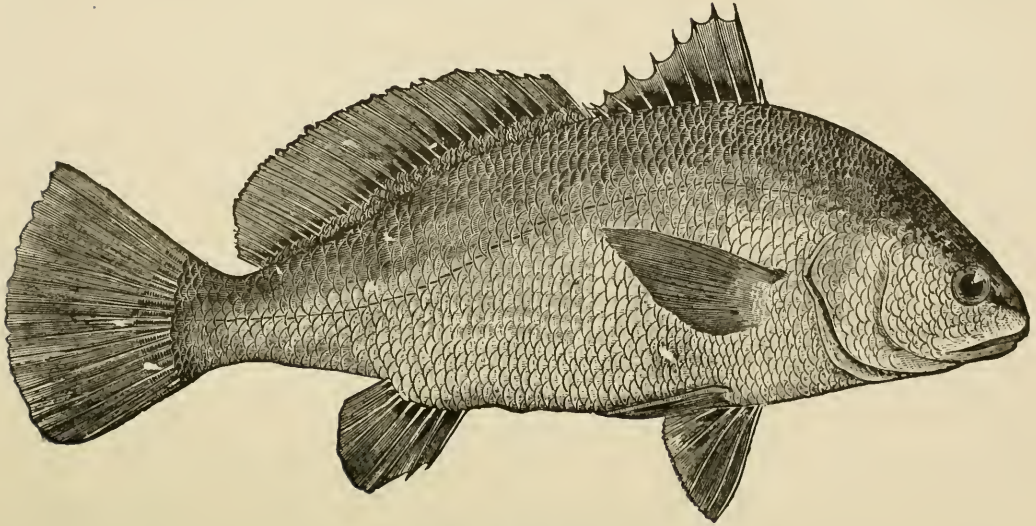
Carp Distributed by Government—Continued.

Name.	Residence.	Postoffice Address or Residence.
B. G. Root	Perry	Tamaroa
J. C. Kinzey	"	"
Geo. Baird	"	Pinckneyville
E. H. Lenen	"	"
M. P. Genen	"	"
J. L. Murphy	"	"
Marion Wright	"	St. John
Wm. E. Brokings	"	DuQuoin
Fritz Dreier	Randolph	Steeleville
D. Scheek	"	"
J. Hagedorn	"	Evansville
Thos. D. Carlton	Johnson	Vienna
H. B. Douglas	Kane	Aurora
C. P. Skinner	Kankakee	Manteno
C. R. Lodge	"	Momence
I. E. Reigler	Kendall	Millbrook
R. B. Cane	LaSalle	Earlville
W. E Dole	"	"
L. H. Davis	"	"
P. A. Morey	"	"
Jas. Cochran	"	Pinkstaff
F. Brian	Lawrence	Sumner
J. C. Cunningham	"	"
Wm. M. Goble	DeKalb	LaClair
Capt J. M. Dysart	Lee	Dixon
J. M. Boyd	Logan	Atlanta
A. Howcocks	McDonough	Bardolph
T. M. Cover	"	Macomb
H. Kline	"	"
Geo. A. Cover	"	"
A. B. Stickle	"	"
Wm. Waggoner	"	Good Hope
E. E. Turner	McHenry	Woodstock
Wm. B. Hewitt	McLean	Cheona
Fred. K. Spannth	Madison	Carpenter
Nicholas Lernas	"	North Alton
C. J. Tolley	Marion	Vernon
Saul J. Hatch	"	"
C. M. Hamilton	"	Salem
Henry Menerly	"	Kinmundy

Recapitulation of Expenditures by Illinois State Fish Commissioners from October 1, 1883, to September 30, 1884.

VOUCHERS AND BILLS OF PARTICULARS ON FILE WITH THE AUDITOR.

Amount to credit of Commissioners Oct. 1, 1883	$1,804 80	
Cash from carp distribution	62 95	
Cash deducted from bill for boats	9 00	
Cash from sale of boat	40 00	
Cash from use of skiffs	10 00	
Appropriation for 1884	5,000 00	
		$6,926 75
Amount expended for October, 1883	$323 25	
" " " November, 1883	419 85	
" " " December, 1883	211 50	
" " " January, 1884	183 90	
" " " February, 1884	131 60	
" " " March, 1884	91 90	
" " " April, 1884	269 23	
" " " May, 1884	249 75	
" " " June, 1884	392 93	
" " " July, 1884	614 22	
" " " August, 1884	394 68	
" " " September, 1884	644 95	
		3,927 76
Amount to credit of Commissioners Oct. 1, 1884		$2,998 99



WHITE PERCH.

FISH COMMISSIONERS.

The following list of Fish Commissioners, revised to October, 1884, is from the AMERICAN FIELD:

DOMINION OF CANADA—
A. W. McLelan ..... Ottawa.
Minister of Marine and Fisheries.

PROVINCE OF BRITISH COLUMBIA—
A. C. Anderson ..... Victoria.

PROVINCE OF NEW BRUNSWICK—
W. H. Venning ..... St. Johns.
Inspector of Fisheries.

PROVINCE OF NOVA SCOTIA—
W. H. Rogers ..... Amherst.
Inspector of Fisheries.

PROVINCE OF PRINCE EDWARD'S ISLAND—
J. H. Duvar ..... Alberton.
Inspector of Fisheries.

UNITED STATES—
Prof. Spencer F. Baird ..... Washington, D. C.
Commissioner of Fisheries.

ALABAMA—
Col. D. R. Hundley ..... Mooresville.
Hon. C. S. G. Doster ..... Prattville.

ARIZONA—
Hon. J. J. Gosper ..... Prescott.
Hon. Richard Rule ..... Tombstone.
J. H. Tagart ..... Yuma.

ARKANSAS—
James H. Hornibrook ..... Little Rock.
H. H. Rottaken ..... Little Rock.

CALIFORNIA—
J. D. Redding ..... San Francisco.
A. B. Dibble ..... Grass Valley.
B. H. Buckingham ..... Washington.

COLORADO—
Wilson E. Sisty ..... Idaho Springs.

CONNECTICUT—
Dr. W. M. Hudson ..... Hartford.
Robert G. Pike ..... Middletown.
James A. Bill ..... Lyme.

DELAWARE—
Enoch Moore, Jr ..... Wilmington.

GEORGIA—
Hon. J. T. Henderson ..... Atlanta.
Commissioner of Agriculture.
Dr. H. H. Cary ..... La Grange.
Superintendent of Fisheries.

ILLINOIS—

N. K. Fairbank, President.....Chicago.
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A CATALOGUE OF THE NATIVE FISHES OF ILLINOIS.

BY S. A. FORBES, PH. D.

Professor of Zoology, Illinois Industrial University.

INTRODUCTION.

The following list is believed to represent correctly our actual knowledge of the names and distribution of the fishes of Illinois at the present time. No species has been entered upon it of which I have not myself studied representative specimens, collected within the State, except a very few inserted upon the high authority of Dr. Jordan and of the curators of the Smithsonian Institution.

My personal studies have been based entirely upon the collection of the State Laboratory of Natural History, made during the past eight years chiefly by myself and two of my assistants, Mr. W. F Garman and Mr. N. K. McCormick.

The waters in which these collections have been made, include Lake Michigan and several of the smaller lakes of Northeastern Illinois; Rock River at Oregon; the Kishwaukee at Belvidere; Pecatonica River and its branches at Freeport, and in that vicinity; and the Galena River in the neighborhood of Galena. Many collections have also been made in Fox River at McHenry and Dayton; in the Illinois at Ottawa, Henry, Peoria, and Pekin, and at its mouth near Grafton; and from the lakes and ponds in the bottoms of these rivers at several of these points. The tributary of the Illinois most carefully searched is the Mackinaw, in Woodford and Tazewell counties. A small creek in Hancock county was likewise thoroughly explored. In the southern part of the State our collections were taken from the lakes and ponds in the Mississippi bottoms of Union County; in Clear Creek and Drury Creek in the same vicinity; in Cache River and its tributaries near Vienna in Johnson County, and at Mound City; in the Wabash River at Carmi and Mount Carmel; and in the Little Wabash, the Embarras, and the Saline, and various tributaries of those streams.

My knowledge of the fishes of the Ohio and Mississippi is derived almost entirely from several weeks' collecting at Cairo and Mound City.

TROUT.

The principal deficiencies in our survey of the ichthyic fauna of the State are likely to be found in the small prairie sloughs of Northern Illinois, in the lower Rock River and its tributaries, (especially the Green River basin), in the Kaskaskia River, and in the Mississippi, along the western border of the State.

The previously published lists of the fishes of Illinois are but few. The first contribution to the subject was a very brief list of common species by Mr. Robert Kennicott, occurring in a catalogue of the animals of Cook county, published in the Transactions of the Illinois State Agricultural Society for 1853-4 (Vol. I). In the bulletin of the Illinois Museum of Natural History, published by us in 1876, was printed a partial catalogue of the fishes of Illinois, prepared by Mr. E. W. Nelson from the fishes at that time in the State Laboratory of Natural History. The circumstances under which this catalogue was prepared, and the numerous changes in nomenclature and in the definition of species made since that day, render the list of little present authority, especially as inference and general information seem to have been sometimes depended on in making up the notes on distribution. A second catalogue, published two years after in the second bulletin of the Laboratory, prepared by Prof. David S. Jordan with some assistance from the present writer, based, like the preceding, chiefly upon the Laboratory collections, was more complete and authoritative; but the progress of ichthyology and a more careful study of the specimens since that date, together with more extensive collections within the State, render this list also largely obsolete.

In the preparation of the following, I have been under especial obligations to Dr. Jordan for notes respecting the synonomy, contributed in advance of publication, and also for a few facts of distribution. I have followed, in the main, the arrangement and nomenclature of the "Synopsis of the Fishes of North America," by Jordan and Gilbert, published as Bulletin No. 16 of the United States National Museum, but have expressed my own views with regard to distinctions of genera and species. The grounds for such changes in nomenclature as are here made, will be given in full in my report on the cold-blooded vertebrates of Illinois, now nearly ready for the press.

In order to afford a clear explanation to students of the sense in which I have used generic and specific terms, I have referred to the above mentioned list in Bulletin No. 2, of the State Laboratory of Natural History, (1878), and to Jordan and Gilbert's Synopsis (Bul. 16, U. S. Nat'l Mus.), in every case where I have departed from the nomenclature or grouping of those papers, the references being made to names with which those here used are to be taken as synonymous. For the first of the above references I have used the abbreviation "Bul. 2"; for the second, "Synop."

The nomenclature of the second edition of Jordan's "Manual of the Vertebrates of the Eastern United States" is nearly the same as that of the list in our Bulletin 2, published the same year. Where it varies, I have added a citation to the "Manual," using the abbreviation "M. V."

CATALOGUE.

Class I. PISCES. (The True Fishes.)

Sub-class Physoclisti.

Order I. ACANTHOPTERI. (The Spiny-rayed Fishes.)

Family I. GADIDÆ. (Cod-fishes.)

Genus 1. Lota, Cuvier.

1. *Lota maculosa Le Sueur.*—Burbot; Ling; Eel Pout.
Taken only in Lake Michigan.

A single specimen occurred some years ago at Naples, on the Illinois River, having evidently entered the river through the canal, then recently opened to the Chicago River.

Family II. COTTIDÆ. (The Sculpins.)

Genus 2. Uranidea, De Kay.

2. *Uranidea richardsoni*, Agassiz.—Miller's Thumb; Blob; Muffle-jaw; Bull-head.

(Bul. II, 50; *Potamocottus alvordi*, *Potamocottus wilsoni*, *Potamocottus meridionalis*.)

This species, the only representative of its family known positively to occur within the limits of our State, is by far the most abundant in Southern Illinois, where it is a common creek species, nestling under stones in shallows and rapids. A single specimen from a muddy stream in McHenry county, and a few from the shallow waters of Lake Michigan, are the only representatives in our collections from the northern part of the State. Other species of this family occurring in Lake Michigan have been found only in the deeper waters outside our limits.

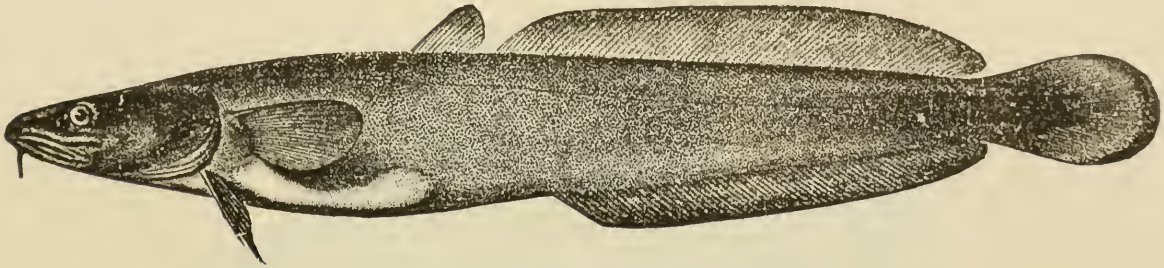
Family III. SCIÆNIDÆ.

Genus 3. Haploidonotus, Rafinesque.

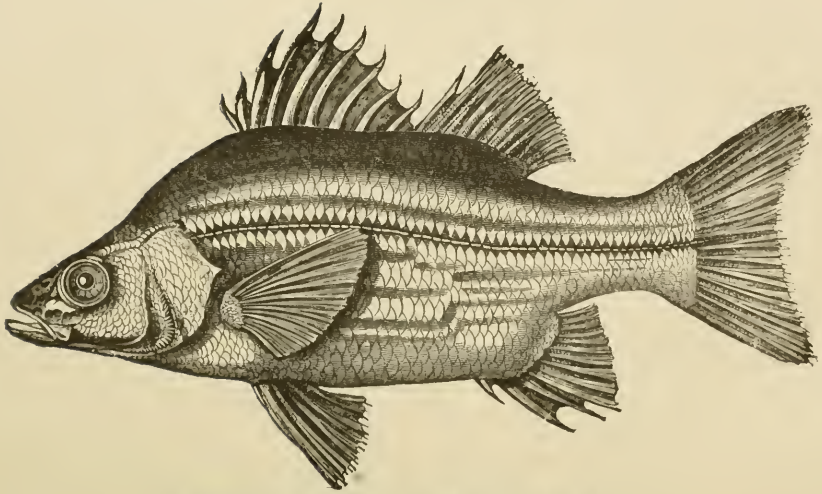
Fresh-water Drums.

3. *Haploidonotus grunniens*, Raf.—Sheepshead; Drum; White Perch; Croaker.

This species occurs in Illinois only in the great lakes and in rivers, occasionally in spring finding its way into creeks tributary to the Illinois and the Ohio.



BURBOT. (*Lota maculosa, L.*)



YELLOW BASS. (*Roccus interruptus, Gill.*)

Family IV. SERRANIDÆ. (The Sea Bass.)

Genus 4. Roccus, Mitchill.

Bass.

4. *Roccus interruptus*, Gill.—Yellow Bass; Striped Bass; Brassy Bass.

(Bul. II, 44; *Morone interrupta*.)

This species has not occurred in Northern Illinois to our knowledge, but has been collected by us almost wholly in the Illinois River and in the bottom lakes connected with that stream.

5. *Roccus chrysops*, Raf.—White Bass; Silver Bass.

Throughout Illinois, in creeks and rivers, and in Lake Michigan, much more rarely in the small northern lakes. It seems, indeed, to be wholly wanting in the lakes of the Fox River system, in which it is said by the older fishermen to have been exterminated by severe winters some years ago. The presence of impassable fish-dams in the Fox River, through which these lakes are drained, probably accounts for its non-appearance since.

Family V. PERCIDÆ.

Sub-family Percinæ. (The True Perches.)

Genus 5. Stizostedium, Raf.

Pike Perches.

6. *Stizostedium canadense*, Smith.—Sauger; Sand-pike; Gray-pike.

The distribution of this species in Illinois is precisely like that of the following.

7. *Stizostedium vitreum*, Mitch.—Wall-eyed Pike; Dory; Glass-eye; Yellow Pike; Blue Pike; "Jack Salmon."

Found only in the larger rivers and lakes; occurring in our collections from the Wabash, Illinois and Rock Rivers. Especially abundant in the former at the rapids above Mt. Carmel.

Genus 6. Perca, Linnæus.

Perch.

8. *Perca americana*, Schranck.—Yellow Perch; American Perch; Ringed Perch.

A very abundant species in the northern part of the State; excessively common in Lake Michigan, where it is caught from the wharves by thousands daily. Also swarming in the small northern lakes, and one of the commonest fishes in the clearer creeks and rivers. In Central Illinois it is somewhat rare, occasional specimens only occurring in the Illinois. In the southern part of the State we have not seen it at all, not a single specimen, in fact, occurring in our collections south of the latitude of Alton. Southward its common name even is applied to other species—the various sunfishes. There is a uniform average difference in brightness of color between the lake and river specimens, the latter being much the brighter, but there are no specific distinctions.

Sub-family Etheostomatinæ. (The Darters.)

Genus 7. Microperca, Putnam.

9. *Microperca punctulata*, Putnam.—Least Darter.

This little species, the smallest of our fishes, is much the commonest northward, but has been taken as far south as Union county. It is less select in its haunts than most of the other Darters, occurring in waters of every description; but we have found it commonest in lakes, and scarcely less abundant along the weedy margins of larger rivers.

Genus 8. Etheostoma, Raf.

10. *Etheostoma eos*, Jor. & Copeland.

(Bul. II, 42; *Boleichthys eos*: Synop., *Pœcilichthys eos.*)

Not especially common in Illinois; chiefly of northern distribution; most abundant in lakes, and occurring also in the smaller rivers.

11. *Etheostoma fusiforme*, Grd.

(Bul. II, 43; *Boleichthys elegans:* Synop., 519 & 520; *Pœcilichthys butlerianus, Pœcilichthys barratti, Pœcilichthys fusiformis.*)

This darter, which has appeared in the earlier lists as *Boleichthys elegans*, is southern in its Illinois distribution, not having occurred north of the Kaskaskia River. To the southward it is rather common in lakes, clear ponds, small rivers and creeks.

12. *Etheostoma asprigene*, Forbes.

(Bul. II, 41; *Pœcilichthys asprigenis:* Synop., 518; do.)

This common species, originally described from the Illinois River, has since been found generally distributed in the central and southern parts of the State, in lakes and rivers, large and small, but has not been taken in Northern Illinois.

13. *Etheostoma cœruleum*, Storer.—Blue Darter; Rainbow Darter; Soldier-fish.

(Bul. II, 41; *Pœcilichthys variatus, Pœcilichthys spectabilis*: Synop., 517 & 518; *Pœcilichthys cœruleus, Pœcilichthys spectabilis.*)

The most highly colored of our common darters, occurring throughout the State in lakes, rivers and creeks, much the most abundant in the latter.

14. *Etheostoma flabellare*, Raf.

Not common. Clear creeks and rivers in Southern Illinois.

15. *Etheostoma lineolatum*, Agassiz.—Striped Darter.

(Bul. II, 42; *Etheostoma flabellare*, var. *lineolatum*.

Rather rare; chiefly from Northern Illinois, in creeks and rivers.

16. *Etheostoma zonale*, Cope.

(Bul. II, 41; *Nanostoma zonale:* Synop., 510; do.)

This little darter is not common in Illinois, and is confined to the northern part of the State, as far as our collections show, where it occurs in creeks and the smaller rivers.

Genus 9. Hadropterus, Agassiz.

17. *Hadropterus evides*, Jordan & Copeland.

(Bul. II, 39; *Ericosma evides:* Synop., 503; *Alvordius evides.*)

Represented in our Illinois collections only by a few specimens from Rock River. Reported by Dr. Jordan from White River, Indiana, but apparently not collected elsewhere.

18. *Hadropterus aspro*, Cope. & Jordan.—Black-sided Darter.

(Bul. II, 39; *Alvordius maculatus:* Synop., 501; *Alvordius aspro.*)

This fine darter is rather common throughout the whole State in large creeks and small rivers, being especially abundant in the Wabash Valley and in the little Wabash, Saline and Embarras Rivers. A few specimens were taken also in the Illinois.

19. *Hadropterus phoxocephalus*, Nelson.

(Bul. II, 39; *Alvordius phoxocephalus:* Synop., 501; do.)

This species, described from specimens taken in Central Illinois, has not yet been found in the northern part of the State, although it is decidedly common from the Illinois River southward, including the Wabash Valley. It occurs in our collections only from the larger streams; such as the Fox, Illinois, Saline and Little Wabash Rivers, and Mackinaw Creek.

Genus 10. Percina, Haldeman.

Log Perches.

20. *Percina caprodes*, Raf.—Log Perch; Rock-fish; Hog-molly; Hog-fish.

(Bul. II, 39; *Percina caprodes, Percina manitou.*)

The largest of its sub-family, and among the most abundant in the northern part of the State. Our collections contain specimens from the borders of Lake Michigan to Cairo and the Wabash Valley. In Northern Illinois it is extremely common in the small lakes and in the streams connected with them, and likewise occurs in other creeks.

Genus 11. Cottogaster, Putnam.

21. *Cottogaster shumardi*, Grd.

(Bul. II, 39; *Imostoma shumardi:* Synop., 498; do.)

Somewhat rare in Illinois, and occurring chiefly in large streams. It has, in fact, been taken by us only from the Rock, Illinois and Wabash Rivers.

Genus 12. Diplesium, Raf.

22. *Diplesium blennioides*, Raf.—Green-sided Darter.

Found by us only in the Wabash Valley, where it is not rare. Collected from the Little Wabash, at Flora.

Genus 13. Boleosoma, De Kay.

Tessellated Darters.

23. *Boleosoma camurum*, Forbes.

(Synop., 493; *Vaillantia camurum.*)

This little species is wide-spread, but somewhat rare, occurring throughout the State in creeks and ponds, but much more abundantly to the southward.

24. *Boleosoma nigrum*, Raf.—Johnny Darter.

(Bul. II, 40; *Boleosoma olmstedi, Boleosoma maculatum.*)

By far the most abundant and widely distributed of the darters, occurring in almost all waters, though of course far more abundantly in creeks, and preferring rocky shallows. I do not know that it is ever found in foul or muddy situations. It ranges throughout the State from the Galena and Calumet rivers on the north, southward to Union county.

Genus 14. Ammocrypta, Jordan.

25. *Ammocrypta asprella*, Jordan.

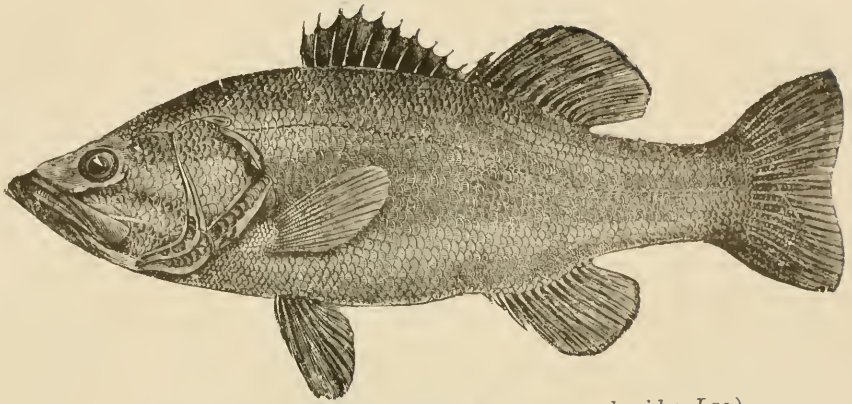
(Bul. II, 38; *Pleurolepis asprellus.*)

The only specimens of this species in our collections are the original types, taken in a small bluff stream in Hancock county. It is reported by Dr. Jordan, however, to range from Illinois to Alabama. The creek in which the type occurred is a muddy stream, with occasional reaches of gravelly bottom.

26. *Ammocrypta pellucida*, Baird.—Sand Darter.

(Bul. II, 38; *Pleurolepis pellucidus.*)

The range of this little darter is limited strictly by the character of the streams which it prefers, as it seems to occur only in somewhat swiftly running waters with sandy bottom. We have taken it in the Little Wabash and the Embarras, and some other creeks of the Wabash Valley, but not elsewhere in the State.



Large-Mouthed Black Bass. (*Micropterus salmoides, Lac.*)

Sub-family Centrarchinæ. (The Sun-fishes.)

Genus 15. Micropterus, Lacépéde.

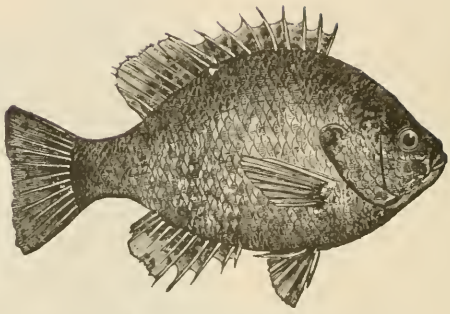
Black Bass.

27. *Micropterus dolomiei*, Lac.—Small-mouthed Black Bass.

(Bul. II, 44; *Micropterus salmoides*.)

Abundant in rivers and larger creeks, but occurring more rarely in lakes preferring swifter water than the preceding

Probably the most abundant of the sun fishes; its preëminence, however, in this respect being disputed by *Lepomis cyanellus* and *gibbosus*. Its distribution and its haunts are more varied than those of either of these species, as it is almost equally abundant in all parts of the State and occurs in all waters—in lakes, ponds, rivers



PUMPKIN SEED, BREAM.

(*Lepomis gibbosus, L.*)

Sub-family Centrarchinæ. (The Sun-fishes.)

Genus 15. Micropterus, Lacépède.

Black Bass.

27. *Micropterus dolomiei*, Lac.—Small-mouthed Black Bass.

(Bul. II, 44; *Micropterus salmoides.*)

Abundant in rivers and larger creeks, but occurring more rarely in lakes, preferring swifter water than the preceding species. It occurs throughout Illinois, but is relatively rare to the southward. Has been taken by us in the Wabash and some of its larger tributaries, but not elsewhere south of the Illinois River.

28. *Micropterus salmoides*, Lac.—Large-mouthed Black Bass; Oswego Bass; Green Bass; Bayou Bass.

(Bul. II, 44; *Micropterus pallidus.*)

The large-mouthed black bass favors especially lakes, ponds and sluggish waters, but occurs also in rivers and large creeks throughout Illinois. It is the common southern form of black bass, although perhaps, on the whole, no more abundant there than in the northern part of the State.

Genus 16. Lepomis, Raf.

29. *Lepomis gibbosus*, L.—Common Sun-fish; Bream; Pumpkin-seed; Sunny.

(Bul. II, 46; *Eupomotis aureus.*)

By far the most abundant sun-fish in Northern Illinois, where it literally swarms in every lake and pond. It occurs, however, throughout the State, but somewhat rarely southward, its place there being taken by *Chænobryttus gulosus.*

30. *Lepomis notatus*, Agassiz.

(Bul. II, 46; *Eupomotis pallidus.*)

A rather rare species, occurring from the Illinois River southward, chiefly in ponds and larger streams.

31. *Lepomis pallidus*, Mitch.—Blue Sun-fish; Copper-nosed Bream; Dollardee; River Sun-fish.

(Bul. II, 45; *Lepiopomus pallidus.*)

Probably the most abundant of the sun fishes; its preëminence, however, in this respect being disputed by *Lepomis cyanellus* and *gibbosus.* Its distribution and its haunts are more varied than those of either of these species, as it is almost equally abundant in all parts of the State and occurs in all waters—in lakes, ponds, rivers

and smaller streams, from Lake Michigan and the Illinois to small creeks and ponds. It is, on the whole, most abundant in the larger rivers, being, in fact, the common sun-fish of the Illinois. Collected by us from Lake to Union county, and in the Wabash Valley.

32. *Lepomis humilis*, Grd.—Red-spotted Sun-fish.

(Bul. II, 45; *Lepiopomus anagallinus.*)

This species, common nowhere, is altogether wanting in Northern Illinois, ranging, according to our collections, from Woodford to Alexander county. It has been collected by us only in creeks.

33. *Lepomis megalotis*, Raf.—Long-eared Sun-fish.

(Bul. II, 46; *Xenotis megalotis, Xenotis inscriptus, Xenotis peltastes.*)

Not especially common within our limits. Most abundant southward. Like most of the sun-fishes it prefers ponds and creeks to larger waters, although we have taken it occasionally in the Illinois River, and more commonly in the Wabash.

34. *Lepomis ischyrus*, Jordan & Nelson.

(Bul. II, 45; *Lepiopomus ischyrus.*)

Of this rare but well-marked species we have taken only the original type, obtained in the Illinois River; but Mr. Nelson has reported a second specimen, collected in the Calumet, near South Chicago. Its resemblances to *L. pallidus* are so strong that, even if abundant, it would probably be usually overlooked by collectors.

35. *Lepomis macrochirus*, Raf.

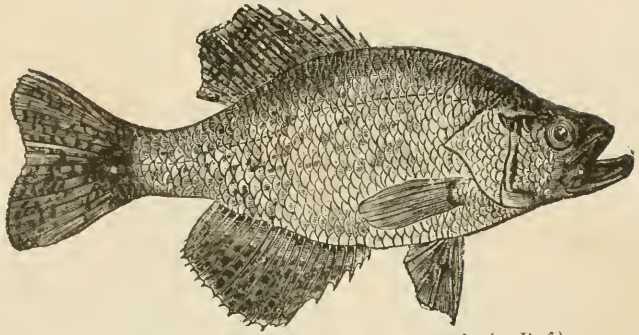
Not seen by me. Reported here on the authority of Dr. Jordan, who has a specimen of the species from the Illinois River.

36. *Lepomis garmani*, Forbes.

This species, but just described, has been seen only in the Wabash River and its tributaries, in the vicinity of Phillipstown and Cairo, in White county.

37. *Lepomis symmetricus*, Forbes.

This species, recently described and still rare in collections, has been taken only in ponds and streams in Central and Southern Illinois. It is found chiefly in the southern part of the State, especially in the Wabash Valley, but is occasionally seen in the Illinois River, and has been taken by us in Union county.



PALE CROPPIE. (*Pomoxys annularis, Raf.*)

38. *Lepomis cyanellus*, Raf.—Red-eye; Blue Spotted Sun-fish.

(Bul. II, 45; *Apomotis cyanellus*.)

This is the most abundant sun-fish of the small prairie streams and pools of Central Illinois, where, in fact, it is almost the only species occurring. It ranges throughout the State, from Cook to Union county, occurring in relatively small numbers in the rivers, but superabundantly in creeks and ponds.

Genus 17. Chænobryttus, Gill.

39. *Chænobryttus gulosus*, C. & V.—Warmouth; Red-eyed Bream.

This sun-fish ranges throughout Illinois, but is far the most abundant southward, where it is one of the commonest species of its family. Indeed, we have not ourselves taken it north of the Illinois River, but Dr. Jordan reports specimens received from Lake Michigan. It is essentially a pond species, but occurs also in the larger streams. In the southern part of the State it receives several of the common names (such as Goggle-eye, Red-eye, etc.,) appropriated northward to the Rock-bass.

Genus 18. Ambloplites, Raf.

40. *Ambloplites rupestris*, Raf.—Common Rock-bass; Red-eye; Goggle-eye.

Quite common northward, but relatively rare in Southern Illinois, where, indeed, we have not yet taken it. As its southern range, however, is said to extend to Louisiana, it probably occurs occasionally in the southern part of this State, and is reported by fishermen to be common in the rapids of the Wabash. In Northern and Central Illinois it is found in streams of all sizes, from small creeks to the Illinois River, and is also common in the smaller lakes.

Genus 19. Pomoxys, Raf.

Croppies.

41. *Pomoxys sparoides*, Lac. Black Croppie; Calico Bass; Grass Bass; Barfish; Butter Bass.

(Bul. II, 47; *Pomoxys nigromaculatus*.)

Found, like the preceding, throughout Illinois, but commonest to the north, occurring in both lakes and streams; most abundant in the former.

42. *Pomoxys annuluris* Raf.—Croppie; Pale Croppie.

Ranges throughout Illinois from Galena to Cairo. Confined principally to the larger streams and their immediate tributaries, it becomes rapidly more abundant as we pass from north to south, finally virtually replacing the preceding species.

Genus 20. Centrarchus, C. & .

43. *Centrarchus macropterus*, Lac.

(Bul. II, 47; *Centrarchus irideus.*)

This is also a species confined in Illinois to the southern part of the State, where we have taken it in Cache River, in Clear and Drury Creeks, in Great House Creek near Mt. Carmel, and in various ponds and sloughs in the river bottoms of that region.

Family VI. ELASSOMATIDÆ.

Genus 21. Elassoma, Jordan.

44. *Elassoma zonatum*, Jordan.

A southern species, not collected by us north of St. Francisville, in Lawrence county. Not uncommon in small, muddy pools.

Family VII. APHREDODERIDÆ.

Genus 22. Aphredoderus, Le Sueur.

45. *Aphredoderus sayanus*, Gilliams.—Pirate Perch.

(Bul. II, 48; *Aphododerus isolepis.*)

Throughout the State from the Calumet to Union county and the Wabash, but far the most abundant southward. Occurs almost invariably in small streams only, but occasionally taken in the Illinois. One of the commonest species in mud holes in the Mississippi bottoms, in Southern Illinois. Very rare in the central prairie region.

Family VIII. ATHERINIDÆ. (The Silversides.)

Genus 23. Labidesthes, Cope.

46. *Labidesthes sicculus*, Cope.—Brook Silverside.

A very abundant minnow in small streams and lakes in Central and Northern Illinois; also occurs rarely in the Wabash Valley, commonly in Rock River, and occasionally in the Illinois.

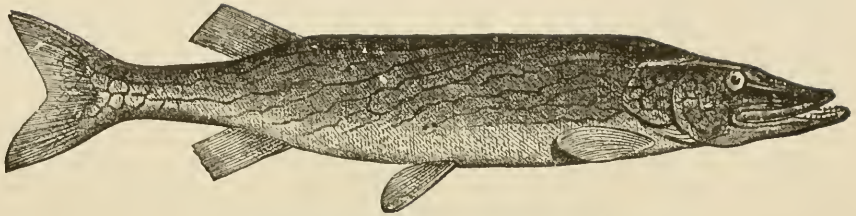
Order II. HEMIBRANCHII.

Family IX. GASTEROSTEIDÆ. (The Sticklebacks.)

Genus 24. Gasterosteus, L.

47. *Gasterosteus inconstans*, Kirt.—Brook Stickleback.

Locally common in rivers and small streams in the northern part of the State only. We have not taken it south of Rock River.



GREEN PIKE. (*Esox reticulaus, Le S.*)

Sub-class PHYSOSTOMI.

Order III. APODES.

The Eels.

Family X. Anguillidæ. (The True Eels.)

Genus 25. Anguilla, Thunberg.

48. *Anguilla rostrata*, Le Sueur.—Common Eel.

Not very abundant, but occurring everywhere in streams of large and moderate size, throughout Illinois.

Order IV. HAPLOMI.

Family XI. ESOCIDÆ. (The Pikes.)

Genus 26. Esox, L.

49. *Esox nobilior*, Thompson.—Muskallunge.

Found by us only in Lake Michigan.

50. *Esox lucius*, L.—Pike.

Throughout the State, but most abundant northward. Occurs also in Lake Michigan.

51. *Esox vermiculatus*, Le Sueur.—Little Pickerel.

(Bul. II, 53; *Esox salmoneus, Esox cypho.*)

An abundant species north and south, occurring most commonly, perhaps, in weedy lakes, but scarcely less frequent along weedy margins of rivers and smaller streams.

Family XII. UMBRIDÆ. (The Mud Minnows.)

Genus 27. Umbra, Müller.

52. *Umbra limi*, Kirt.—Mud Minnow.

(Bul. II, 52; *Melanura limi.*)

Lakes and muddy ponds in northern and southern Illinois; not taken by us in the central part of the State. Occurs occasionally in running streams, as in Fox River, at McHenry.

Family XIII. CYPRINODONTIDÆ. (The Toothed Minnows.)

Genus 28. Gambusia, Poey.

53. *Gambusia patruelis*, B. & G.

(Bul. II, 52; *Zygonectes melanops:* Synop., 340 and 892; *Zygonectes melanops, Zygonectes inurus.*)

A southern species, not collected by us north of White county. Abundant in ponds and streams in the hill region of Southern Illinois.

A comparison of Illinois specimens of "*melanops*" with *Gambusia patruelis* from North Carolina, leaves no doubt of both generic and specific identity. Our Illinois examples were many of them with living young.

Genus 29. Zygonectes, Agassiz.

Top Minnows.

54. *Zygonectes dispar*, Agassiz.

Throughout the State in small lakes, ponds, and creeks, and occurring rarely in the main stream of the Illinois River. Chiefly a pond species.

55. *Zygonectes notatus*, Raf.—Top Minnow.

Ranges throughout the State, but is far the most abundant southward. Common in small creeks and stagnant pools. Apparently able to live in any water.

Genus 30. Fundulus, Lacépéde.

Killifishes.

56. *Fundulus diaphanus*, Le Sueur.—Spring Minnow.

Abounds in the small lakes and streams of extreme Northern Illinois. Not seen in the central or southern parts of the State. It is somewhat abundant along the weedy margins of the small lakes, and has been found but once or twice by us in streams.

Family XIV. AMBLYOPSIDÆ. (The Blind Fishes.)

Genus 31. Chologaster, Agassiz.

57. *Chologaster papiliferus*, Forbes.

Confined to cave streams and limestone springs of Southern Illinois at their immediate origin in the bluffs. It is unquestionably a subterranean species.

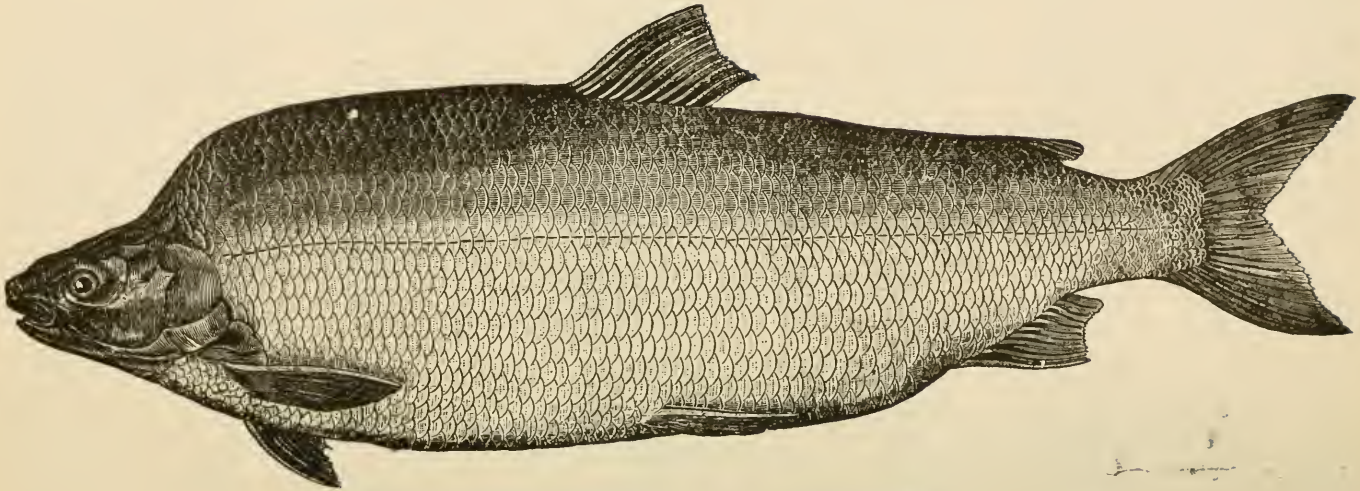
Order V. ISOSPONDYLI.

Family XV. PERCOPSIDÆ. (The Trout Perches.)

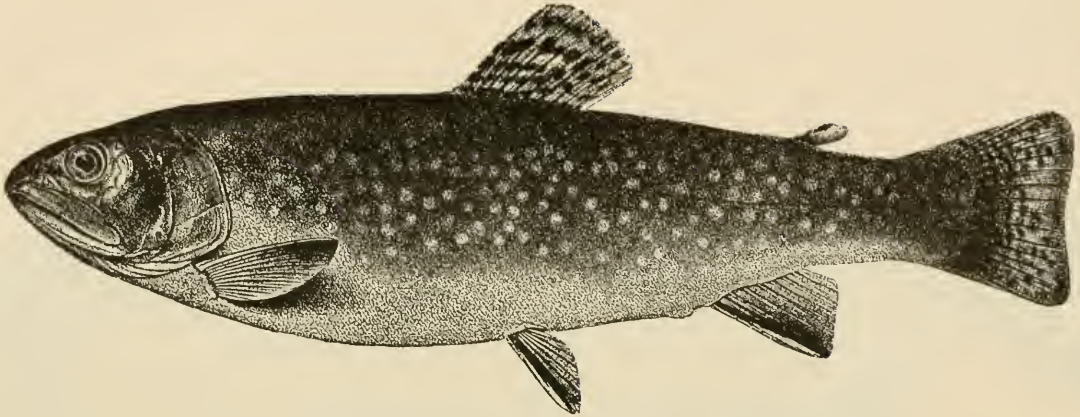
Genus 32. Percopsis, Agassiz.

58. *Percopsis guttatus*, Agassiz.—Trout Perch.

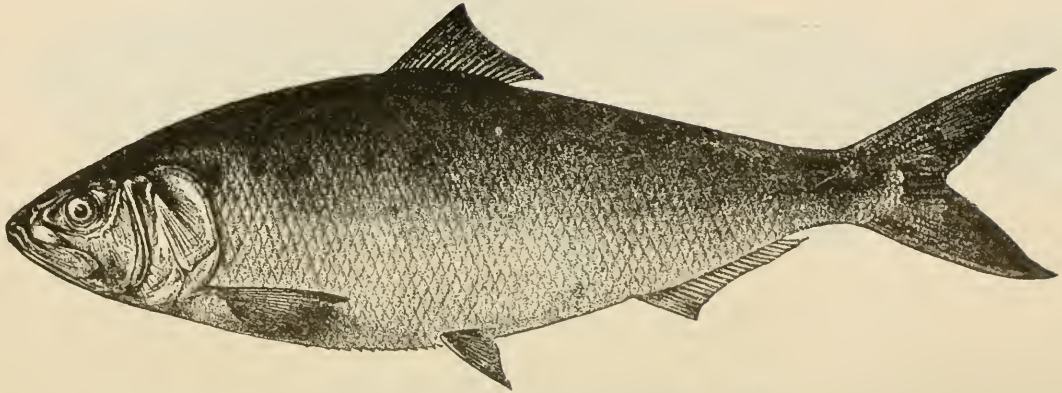
A common fish of the great lakes. Not often taken from rivers, but obtained by us a few times in the Illinois. Apparently frequents deep water.



COMMON WHITEFISH. (*Coregonus clupeiformis, Mitch.*



BROOK TROUT. (*Salmo Fontinalis, Mitch.*)



COMMON SHAD. (*Clupea sapeidissima, Wils.*)

Family XVI. SALMONIDÆ. (The Salmon.)

Genus 33. Salvelinus, Richardson.

Trout.

59. *Salvelinus namaycush*, Walb.—Mackinaw Trout; Great Lake Trout.

(Bul. II, 54; *Christivomer namaycush.*)

Occurs only in Lake Michigan.

Genus 34. Coregonus, L.

White Fish.

60. *Coregonus artedi*, Le Sueur.—Lake Herring; Cisco; Michigan Herring.

Extremely abundant in Lake Michigan; occurring also in the small lakes of Indiana and Wisconsin (where it is known as the Cisco) but not in those of Illinois.

61. *Coregonus clupeiformis*, Mitch.—Common White Fish.

Occurring only in Lake Michigan, and there, at present, chiefly in the deeper water outside the limits of this State.

Family XVII. DOROSOMATIDÆ. (The Gizzard Shads.)

Genus 35. Dorosoma, Raf.

62. *Dorosoma cepedianum*, Le Sueur. — Gizzard Shad; Hickory Shad; Skip Jack.

One of the most abundant of our river fishes, and an extremely valuable article of food for the game species. It is confined to the larger rivers and their immediate tributaries, occurring in lakes and ponds only when left by the overflow. It was reported some years ago to have entered Lake Michigan by way of the canal, and to have multiplied there at an extraordinary rate; but I have not lately heard of it in those waters, nor seen it in the catches of the fishermen at South Chicago. We have obtained it from Galena to Cairo and the Wabash Valley, in the Mississippi, Ohio and Illinois Rivers and their larger and more immediate tributaries, and in ponds near St. Francisville.

Family XVIII. CLUPEIDÆ. (The Herrings.)

Genus 36. Clupea, L.

Herrings.

63. *Clupea chrysochloris*, Raf.—Ohio Shad; Golden Shad.

(Bul. II, 55; *Pomolobus chrysochloris.*)

One of the rarer fishes of our larger rivers, appearing in our collections only from the Illinois, Ohio and Mississippi Rivers. Said to have been introduced, through the canal, into Lake Michigan.

Family XIX. HYODONTIDÆ.

Genus 37. Hyodon, Le Sueur.

Moon Eyes.

64. *Hyodon tergisus,* Le Sueur.—Moon Eye; Toothed Herring.

A moderately common fish in the Illinois, Mississippi and Ohio Rivers, but not occurring in smaller streams.

65. *Hyodon alosoides,* Raf.

Taken by us only in Galena River, in extreme Northern Illinois.

Order VI. EVENTOGNATHI.

Family XX. CYPRINIDÆ. (The Minnows.)

Genus 38. Notemigonus, Raf.

66. *Notemigonus chrysoleucus,* Mitch.—Golden Shiner; Bream.

In Illinois this species occurs everywhere, in waters of all descriptions—lakes, ponds, creeks and rivers, although most abundant in small ponds and muddy creeks.

Genus 39. Opsopœodus, Hay.

67. *Opsopœodus emiliæ,* Hay.

(Synop. 247; *Opsopœodus emiliæ, Trycherodon megalops.*)

This species has occurred sparingly in our collections throughout the State, and only in running streams or in lakes immediately connected with them. Very abundant in ponds near Mt. Carmel.

Genus 40. Squalius, Bonaparte.

Dace.

68. *Squalius elongatus,* Kirtland.—Red-sided Shiner.

Said by Dr. Jordan to occur in Lake Michigan and in Rock River. Not seen by us from Illinois.

Genus 41. Semotilus, Raf.

69. *Semotilus dissimilis,* Kirtland.—Spotted Shiner.

(Bul. II, 72; *Ceratichthys dissimilis*: Synop. 216; *Ceratichthys sterletus.*)

Has occurred in Illinois only in rivers and in lakes immediately connected with them. It has been collected by us in the Rock, Illinois and Ohio.

70. *Semotilus amblops*, Raf.—Silver Chub.

(Bul. II, 62; *Ceratichthys amblops*: Synop. 214; do.)

This fish has been obtained by us not rarely in Illinois, chiefly from the Ohio and the Wabash and the larger tributaries of the latter.

71. *Semotilus biguttatus*, Kirt.—Horny Head; River Chub; Jerker.

(Bul. II, 62; *Ceratichthys biguttatus*: Synop. 212; do.)

This species seems limited, in Illinois, to creeks and rivers, and has not occurred in our collections south of the center of the State.

72. *Semotilus corporalis*, Mitch.—Chub; Horned Dace.

Almost wholly confined to small streams, in which it is, in Illinois, the most abundant minnow, commonest in those with muddy bottom; but a few have been obtained in the Illinois River, from lakes in the Illinois bottoms, and from the Little Wabash. It ranges throughout the State.

Genus 42. Platygobio, Gill.

Flat-headed Chubs.

73. *Platygobio pallidus*, Forbes.

A single specimen of this very rare species, obtained in the Ohio River at Cairo, is the only one hitherto taken.

Genus 43. Couesius, Jordan.

74. *Couesius prosthemius*, Cope.

Not in our collection. Specimens from near Evanston, taken in Lake Michigan, are said by Dr. Jordan to be in the National Museum.

Genus 44. Rhinichthys, Agassiz.

75. *Rhinichthys atronasus*, Mitch.—Black-nosed Dace.

(Bul. II, 62 and 63; *Rhinichthys cataractæ*, *Rhinichthys obtusus*, *Rhinichthys meleagris*: Synop. 207, 208; *Rhinichthys cataractæ*, *Rhinichthys atronasus*, *Rhinichthys obtusus*.)

This is essentially a brook species, delighting especially in swift and rocky streams. We have not found it in Southern Illinois, its localities being confined, in our experience, to the northern half of the State. Its relative rarity here is doubtless due to the infrequent occurrence of suitable streams.

Genus 45. Phenacobius, Cope.

76. *Phenacobius mirabilis*, Grd.

(Bul. II, 61; *Phenacobius scopiferus.*)

Occurs somewhat rarely throughout the State, from Galena to extreme Southern Illinois; almost invariably in small swift streams, or in the rapid, rocky parts of more sluggish creeks.

Genus 46. Ericymba, Cope.

77. *Ericymba buccata*, Cope.

We have found this species only in the sandy stretches of the tributaries of the Wabash, where it is locally very abundant.

Genus 47. Notropis, Raf.

Shiners.

78. *Notropis dinemus*, Raf.—Emerald Minnow.

(Bul. II, 60; *Notropis rubrifrons, Notropis atherinoides:* Synop., 202 and 203; *Minnilus rubellus, Minnilus dinemus, Minnilus rubrifrons.*)

Excessively abundant; far commonest northward, but confined everywhere almost strictly to the larger lakes and rivers. Not a single specimen has occurred in our collections from the smaller lakes in Northeastern Illinois, while the waters of Lake Michigan, a few miles distant, were swarming with them along the shore. Not abundant in the Ohio and northern Mississippi, but rather common in the Illinois. From the smaller tributaries of these streams we have not so much as one of this species. In the Wabash and Saline Rivers, in Southern Illinois.

79. *Notropis macrolepidotus*, Forbes.

A very rare minnow, taken thus far only from the Illinois River.

80. *Notropis atripes*, Jordan.—Red Fin.

(Bul. II, 59; *Lythrurus atripes, Lythrurus diplæmius:* Synop., 197; *Minnilus atripes, Minnilus diplæmius.*)

This species prefers especially small clear streams, in which it is occasionally abundant; but owing probably to the relative scarcity of such waters in Illinois, it occupies a subordinate place among our cyprinoids. It is commonest in the extremes of the State, occurring but rarely throughout the central prairie region.

81. *Notropis jejunus,* Forbes.

(Bul. II, 60; *Episema jejuna:* Synop., 194; *Minnilus jejunus.*)

A species of the larger rivers, occurring in our collections only from the Ohio, Illinois, Wabash and Mississippi, or at short distances from these streams, in lakes and tributaries immediately connected with them. Not taken in Northern Illinois.

82. *Notropis megalops,* Raf.—Shiner, Red-fin, Dace.

(Bul. II, 57; *Luxilus cornutus:* Synop., 186; *Minnilus cornutus.*)

An extremely abundant fish, perhaps the commonest of the cyprinoids; most common in rivers and creeks and to the northward, but also found in Southern Illinois, and occasionally in lakes and ponds.

83. *Notropis whipplei,* Grd.—Silver-fin.

(Bul. II, 57; *Photogenis analostanus:* Synop., 178 and 179; *Cliola whipplei, Cliola analostana,* etc.: M. V., 294; *Luxilus analostanus.*)

Most abundant in the northern part of Illinois, occurring principally in rivers and larger creeks, but likewise rather common southward. It is not unknown from the lakes, but we have found it almost strictly confined to running water.

84. *Notropis lutrensis,* B. & G.

(Bul. II., 57: *Cyprinella forbesi*: Synop., 174 and 175; *Cliola forbesi, Cliola lutrensis,* etc.: M. V., 406; *Cyprinella forbesi.*)

This active little fish delights in the rocky ripples of swift, small streams. It is essentially a southern species, and is much the most abundant to the southward in this State. Along the Mississippi, however, its range extends to extreme Northern Illinois. We found it in great numbers in some creeks in western Hancock county. The small, swift streams running down from the bluffs of the Mississippi River are its favorite haunts. A few specimens have been taken in the Illinois, but it is not known from the lakes, from the Wabash region, or from the small interior streams.

85. *Notropis hudsonius,* Clinton.—Spawn-eater.

(Bul. II., 56; *Alburnops hudsonius, Alburnops storerianus*: Synop., 171; *Cliola hudsonius*: M. V., 290; *Hybobsis hudsonius.*)

Common everywhere to the northward, especially in Lake Michigan and the smaller lakes of Northern Illinois. Collected to our extreme southern limits, but not abundant south of the central part of the State. Next to the lakes we have found it most abundant in the Illinois River, and it has occurred likewise in smaller streams from the Calumet River, in Chicago, to the larger creeks of Union county.

86. *Notropis phenacobius*, Forbes.

Very rare, at Peoria; not seen elsewhere.

87. *Notropis stramineus*, Cope.—Straw-colored Minnow.

(Bul. II., 57; *Alburnops stramineus*: Synop., 167; *Cliola stramineus*: M. V., 291; *Hybopsis stramineus*.)

This species is rare in our collections, and has occurred only in rivers and small streams in Central and Northern Illinois.

88. *Notropis fretensis*, Cope.

(Bul. II., 57; *Alburnops fretensis*: Synop., 167; *Cliola fretensis*: M. V., 292; *Hybopsis fretensis*.)

Very rare in Illinois; not more than a single specimen among all our cyprinoids certainly belonging to this species.

89. *Notropis anogenus*, Forbes.

Thus far taken only in Fox River, at McHenry, Illinois.

90. *Notropis heterodon*, Cope.

(Bul. II., 62; *Hemitremia heterodon*: Synop., 163; do.)

This is, within our limits, essentially a species of lakes and larger streams in Northern Illinois, although the form with perfect lateral line has been collected in small numbers from the southern extremity of the State. It is one of the most abundant minnows in the small lakes, northward. It likewise inhabits the Illinois River and the bottom lakes communicating with that stream.

Genus 48. Cliola, Girard.

Silver Fins.

91. *Cliola vigilax*, B. & G.

(Bul. II, 56; *Alburnops tuditanus*: Synop., 165; *Cliola tuditana*.)

Abundant in small streams throughout Illinois. Seems to have been usually confounded with *Pimephales notatus*, to which it bears a strong general resemblance.

Genus 49. Pimephales, Raf.

Fat-heads.

92. *Pimephales notatus*, Raf.—Blunt-nosed Minnow.

(Bul. II, 55 and 56; *Hyborhynchus notatus*, *Hyborhynchus superciliosus*: Synop., 159 and 160; do.)

One of the commonest of our fishes; extremely abundant in the prairie streams which characterize so large a part of Illinois. It chiefly

affects, however, gravelly spots in muddy streams. It is not common in rivers, but is occasionally taken at the mouths of creeks. It has not been found by us in ponds, but specimens were collected from the small lakes of Northern Illinois.

93. *Pimephales promelas*, Raf.—Fat-head; Black-headed Minnow.

The distribution of this fish in the State is somewhat peculiar. The species is altogether absent, as far as our collections indicate, from the prairie streams of Central Illinois. It is not uncommon in small muddy creeks connected with the larger rivers, and occurs occasionally in these latter streams themselves. We have not taken it in lakes or ponds or similar waters, neither has it occurred to us in Illinois south of the latitude of Alton.

Genus 50. Hybognathus, Agassiz.

94. *Hybognathus nubilus*, Forbes.

(Bul. II, 56; *Alburnops nubilus*: Synop., 167; *Cliola nubila*.)

This minnow has thus far been reported only from Illinois, and has occurred in our collections only from the extreme northern part of the State—from the Rock River and its tributaries.

95. *Hybognathus nuchalis*, Agassiz.—Silvery Minnow.

Almost strictly a river species, being most abundantly represented in our collections from the Illinois, and next from the Wabash, Ohio and Mississippi. We have not taken it in any lake or pond outside the great river bottoms, and it has occurred but rarely in creeks.

Genus 51. Chrosomus, Raf.

96. *Chrosomus erythrogaster*, Agassiz.—Red-bellied Dace.

This species has occurred sparingly in our collections, but from all parts of the State, both in rivers and small streams. We have not taken it, however, from lakes or ponds.

Genus 52. Oxygeneum, Forbes.

97. *Oxygeneum pulverulentum*, Forbes.

Only a single specimen of this genus and species is thus far known, and this was taken from the Illinois River, at Peoria.

Genus 53. Campostoma, Agassiz.

98. *Campostoma anomalum*, Raf.—Stone-roller; Stone-lugger.

This species is very common in small streams throughout the State, from Galena to Cairo, and occurs occasionally in rivers, but rarely or never in lakes and ponds.

Family XXI. CATOSTOMIDÆ. (The Suckers.)

Genus 54. Placopharynx, Cope.

Big-jawed Suckers.

99. *Placopharynx carinatus*, Cope.

This species has not actually occurred in our personal collections from Illinois, but has been received by Dr. Jordan from the Illinois River, and is said by fishermen to be rather common in the Wabash. Its resemblances, to Moxostoma are so strong that it would very probably be passed by collectors as belonging to that genus.

Genus 55. Moxostoma, Raf.

Red Horse.

100. *Moxostoma aureolum*, Le S.

Distribution like that of the following species, from which it is, in my opinion, but doubtfully distinct. Less common in Illinois than *macrolepidotum*.

101. *Moxostoma macrolepidotum*, Le Sueur.—Common Red Horse; Mullet; White Sucker; Large-scaled Sucker.

(Bul. II, 63 and 64; *Myxostoma macrolepidotum*, *Myxostoma velatum*.)

Very abundant everywhere in lakes, rivers, and smaller streams. It inhabits Lake Michigan and the smaller lakes in Northern Illinois, and is not less common to the southward. Where the common sucker is not known its name is appropriated to this species, the name of "red horse" being rarely heard in Southern Illinois.

102. *Moxostoma carpio*, Val.—Carp Mullet.

Said by Dr. Jordan to occur in the Great Lakes. Not positively identified by me in Illinois, the common lake mullet of South Chicago not being clearly different, to my mind, from *Moxostoma macrolepidotum*.

Genus 56. Minytrema, Jordan.

Spotted Suckers.

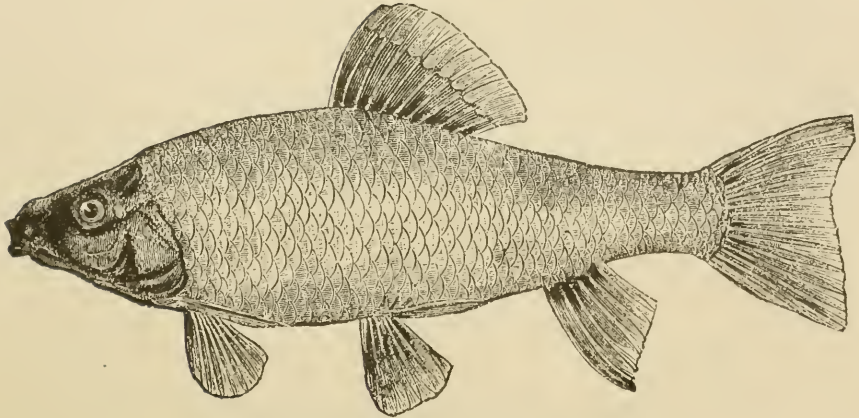
103. *Minytrema melanops*, Raf.—Spotted Mullet; Striped Sucker.

Moderately common in streams throughout the State.

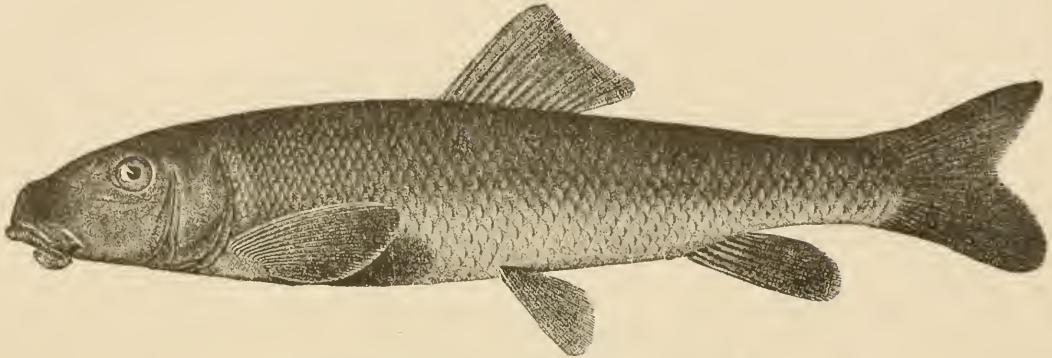
Genus 57. Erimyzon, Jordan.

104. *Erimyzon sucetta*, Lac.—Creek-fish; Chub-sucker.

Everywhere abundant in streams and lakes, ascending creeks in spring. Occurs in our collections from McHenry to Union county.



CHUB SUCKER. (*Erimyzon sucetta, Lac.*)



COMMON SUCKER. (*Catostomus teres, Mit.*)

Genus 58. Catostomus, Le Sueur.

Suckers.

105. *Catostomus nigricans*, Le Sueur.—Hog-sucker; Stone-roller; Toter; Crawl-a-bottom; Hammer-head; Stone-lugger; Hog-molly.

Occurs chiefly in streams, and frequents their rapids and shallows in clear water. Commonest to the northward, probably owing to the clearer and more rocky character of the streams of that part of Illinois. Taken rarely in lakes.

106. *Catostomos teres*, Mitch.—Common Sucker; White Sucker; Brook Sucker; Fine-scaled Sucker.

(Bul. II, 64; *Catostomus commersonii*: Synop. 129; do.)

Abundant northward, occurring rarely in the Illinois as far south as Peoria, and still more rarely in the extreme southern part of the State. Where it is abundant, it inhabits nearly all waters, both lakes and flowing streams. It is common in Lake Michigan.

Genus 59. Cycleptus, Raf.

Black Horse.

107. *Cycleptus elongatus*, Le Sueur.—Black Horse; Gourd-seed Sucker; Missouri Sucker.

Rare in this State, occurring only in the larger rivers. Taken by us only from the Illinois.

Genus 60. Ictiobus, Raf.

Buffalo Fishes.

108. *Ictiobus cyprinus*, Le Sueur.—Carp Sucker; River Carp.

(Bul. II, 65; *Carpiodes velifer, Carpiodes selene, Carpiodes cutisanserinus, Carpiodes difformis, Carpiodes bison, Carpiodes cyprinus, Carpiodes thompsoni, Carpiodes carpio*: Synop., 113, 119, 120; *Carpiodes carpio, Carpiodes thompsoni, Carpiodes bison, Carpiodes cyprinus, Carpiodes difformis.*)

Abundant in the great rivers of the State and their larger tributaries, and also in Lake Michigan and the smaller lakes of Northern Illinois. Extremely common in the lakes and ponds of the river bottoms.

After prolonged study of the so-called species of native carp represented in our collections, I have been compelled to merge them all in one, under the oldest specific name.

109. *Ictiobus bubalus*, Raf.—Small-mouthed Buffalo; Quill Back Buffalo.

(Bul. II, 66; *Bubalichthys cyanellus:* Synop., 116; *Bubalichthys altus*; M. V., 324 and 325; *Bubalichthys altus, Bubalichthys bubalinus.*)

A very abundant fish in the larger streams, and in the bottom lakes; this and the red-mouth being the species commonly shipped under the name of "buffalo fish," from the Illinois and the other larger rivers. They are among the most important commercial fishes in our streams.

110. *Ictiobus urus*, Agassiz.—Big-mouthed Buffalo; Black Buffalo; Mongrel Buffalo.

Bul. II, 65; *Bubalichthys urus:* M. V., 323; *Ichthyobus cyanellus.*)

Taken by us only in the Illinois River, where it is somewhat rare.

111. *Ictiobus cyprinellus*, C. & V.—Red-mouth Buffalo.

(Bul. II, 65; *Ichthyobus bubalus:* Synop., 114; *Ictiobus bubalus.*)

One of the most abundant edible fishes in the larger rivers and their lakes, ascending the smaller creeks in spring. In the Laboratory collections from the Illinois and its larger tributaries, and from the Ohio and Wabash.

Order VII. NEMATOGNATHI.

Family XXII. SILURIDÆ. (The Cat-Fishes.)

Genus 61. Ictalurus, Raf.

112. *Ictalurus furcatus*, C. & V.

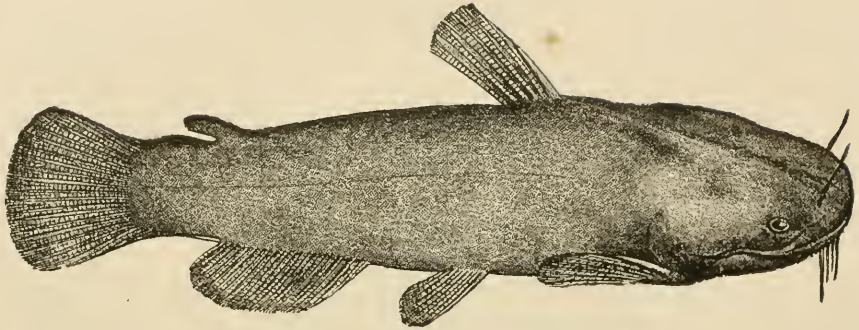
Confined, in our experience, to southern localities, and taken by us only in the Ohio. Not known in the Illinois River, as far as I am aware; known to the southward, at least, as the channel cat or blue cat. I have not taken this species in creeks.

113. *Ictalurus punctatus*, Raf.—Willow Cat; Channel Cat; White Cat.

(Bul. II, 66; *Ichthælurus punctatus, Ichthælurus robustus.*)

Abundant from the larger rivers, reaching a weight of from 20 to 25 pounds.

Found in the deeper water of the Mississippi, Ohio, and Illinois, and occurring likewise in the larger creeks connected with these streams, and occasionally in overflow ponds in the river bottoms.



YELLOW CAT. (*Ictalurus natalis, Le S.*)

114. *Ictalurus ponderosus*, Bean.—Great Cat-fish.

One of the gigantic cat-fishes. Described from the Mississippi at St. Louis. Has not occurred in our collections, unless some specimens belong to it which are apparently intermediate between this and *Ictalurus nigricans*. I doubt if it is distinct from the latter.

115. *Ictalurus nigricans*, Le Sueur.—Cat-fish of the Lakes; Great Fork-tail Cat; Mississippi Cat; Florida Cat; Flannel-mouth Cat.

Bul. II, 66; *Amiurus nigricans*: Synop., 108; *Ictalurus lacustris*.

One of the gigantic cat-fishes of the Ohio, Illinois and Mississippi, and of Lake Michigan. Probably the most abundant of the large species.

116. *Ictalurus natalis*, Le Sueur.—Yellow Cat.

Bul. II, 66; *Amiurus natalis*: Synop., 105; do.)

Occurs everywhere throughout Illinois, but less abundantly than *nebulosus*, and preferring larger streams. It has not been taken by us from ponds and lakes except where these were immediately connected with streams subject to overflow.

117. *Ictalurus nebulosus*, Le Sueur.—Bull-head; Horned Pout; Small Cat-fish.

(Bul. II, 66; *Amiurus vulgaris, Amiurus catus, Amiurus melas, Amiurus xanthocephalus*: Synop., 104; *Amiurus xanthocephalus, Amiurus melas, Amiurus catus*.)

Abundant in all waters, frequenting by preference ponds and muddy streams. It occurs, however, in clear lakes and creeks, and has been taken by us occasionally in the larger rivers. It is the everywhere abundant "bull-head," or "bull-pout."

118. *Ictalurus marmoratus*, Holbrook.—Marbled Cat.

(Bul. II, 67; *Amiurus marmoratus*: Synop., 104; do.)

The Marbled Cat has not occurred in the northern part of the State, but seems to be most abundant in the Illinois and its tributaries. Confined almost wholly to the larger streams and their immediate affluents, in Central and Southern Illinois.

Genus 62. Leptops, Raf.

Mud Cats.

119. *Leptops olivaris*, Raf.—Mud Cat; Yellow Cat.

Bul. II, 67; *Pelodichthys olivaris*.

Common in the larger streams. Obtained by us only from the Illinois, Wabash and Ohio Rivers.

Genus 63. Noturus, Raf.

Stone Cats.

120. *Noturus flavus*, Raf.—Common Stone-cat.

Rather common in Illinois, in creeks of moderate size.

121. *Noturus exilis*, Nelson.

Rare in this State, only two specimens occurring in our collections besides the original type. Creeks in DeKalb, Woodford and Union Counties.

122. *Noturus miurus*, Jordan.

Taken by us only in Southern Illinois, in the Cache and Wabash Rivers.

123. *Noturus gyrinus*, Mitch.

(Bul. II, 68; *Noturus sialis*.)

This species occurs throughout Illinois, but has been confined in our collections mostly to lakes, rivers, and large creeks. It is not by any means restricted to rocky situations, but seems rather to prefer the muddy parts of both the rivers and lakes in which it occurs.

Sub-class HOLOSTEI.

(The Bony Ganoids.)

Order VIII. HALECOMORPHI.

Family XXIII. AMIIDÆ.

Genus 64. Amia, L.

124. *Amia calva*, L.—Mud-fish; Dog-fish; Grindle.

Very abundant throughout the State, in the lakes and larger streams, and also common in ponds in Southern Illinois.

Order IX. GINGLYMODI.

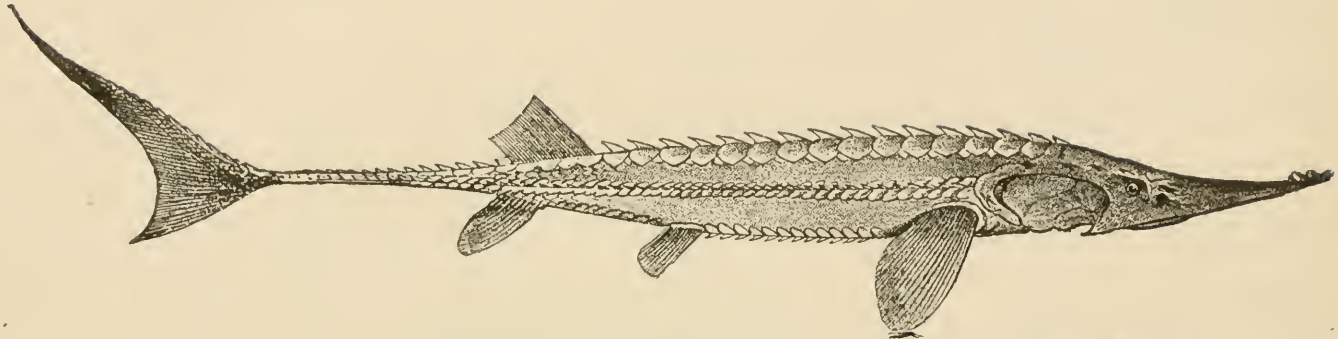
Family XXIV. LEPIDOSTEIDÆ. (The Gar Pikes.)

Genus 65. Litholepis, Raf.

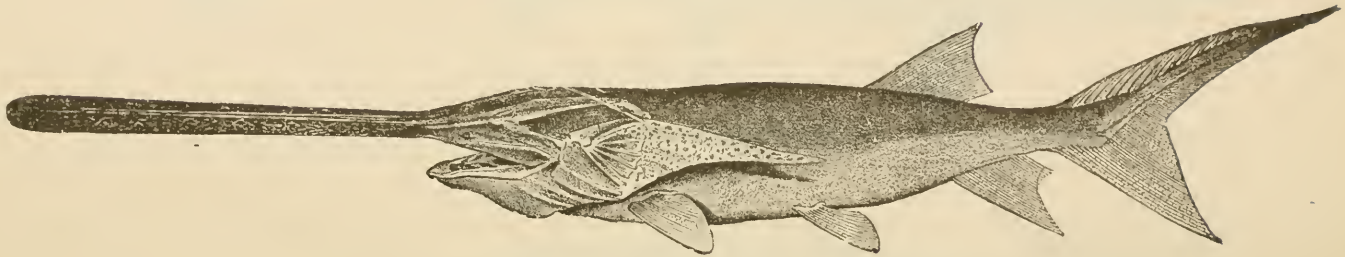
125. *Litholepis tristœchus*, Bloch & Schneider.—Alligator Gar.

(Bul. II, 69. *Litholepis spatula*.)

Not common in Illinois, occurring somewhat rarely in the Ohio and Mississippi Rivers, occasionally in the Illinois, and in at least a single instance, in the Big Muddy, near Carbondale.



SHOVEL NOSED STURGEON. (*Scaphirhynhops Platyrhynchus, Ref.*)



SHOVEL FISH. (*Polyodon Spathula Whab.*)

Genus 66. Lepidosteus, Lacepède.

126. *Lepidosteus platystomus*, Raf.—Short-nosed Gar.

One of the most abundant of the larger Illinois fishes, rarely occurring, however, in the smaller streams, and confined chiefly to the larger rivers and the lakes and ponds connected with their waters. It is also taken in Lake Michigan.

127. *Lepidosteus osseus*, L.—Long-nosed Gar; Bill-fish; Common Gar Pike.

Generally abundant in the larger streams throughout the State, and taken by us in the Illinois, Mississippi and Ohio. Occurs also in the smaller lakes in Northern Illinois.

Sub-class CHONDROSTEI.

Order X. GLANIOSTOMI.

(The Sturgeons.)

Family XXV. ACIPENSERIDÆ.

Genus 67. Scaphirhynchops, Gill.

128. *Scaphirhynchops platyrhynchus*, Raf.—Shovel-nosed Sturgeon; White Sturgeon.

Taken by us somewhat rarely in the Ohio and Mississippi Rivers at Cairo, and in the Illinois at Peoria.

Genus 68. *Acipenser*, L.

129. *Acipenser rubicundus*, Le Sueur.—Lake Sturgeon; Ohio Sturgeon; Black Sturgeon; Stone Sturgeon; Rock Sturgeon.

(Bul. II, 69; *Acipenser maculosus*, *Acipenser rubicundus*.)

Ohio, Mississippi and Illinois Rivers and Lake Michigan. Reaches, in the last, a weight of a hundred and fifty pounds, or more. The characters vary greatly with age and size.

Order XI. SELACHOSTOMI.

Family XXVI. POLYODONTIDÆ.

Genus 69. Polyodon, Lacépède.

130. *Polyodon spathula*, Wall.—Shovel-fish; Paddle-fish; Spoon-bill Cat; Duck-bill Cat.

(Bul. II, 69; *Polyodon folium*.)

Abundant in the Mississippi and Illinois Rivers, and especially in the ponds and lakes in the bottoms of these streams. Rarely, if ever, ascending smaller streams, and not collected by us in any of the interior lakes. Not known from Lake Michigan. Hausman

Bros., a firm of fishermen at South Chicago, reported the capture of a single specimen of this species in the Calumet River, probably an emigrant by way of the canal.

Class II. MARSIPOBRANCHII.

(The Myzonts.)

Order XII. HYPEROARTIA.

Family XXVII. PETROMYZONTIDÆ (The Lampreys.)

Genus 70. Ichthyomyzon, Girard.

Silvery Lampreys.

131. *Ichthyomyzon argenteus*, Kirt.—Silvery Lamprey.

(Bul. II, 70; *Ammocœtes argenteus*, *Ammocœtes hirudo*.)

Collected by us chiefly in the Illinois and Ohio Rivers, attached to shovel-fish, cat-fish, sturgeon, buffalo and other large species, as taken in the nets of the fishermen.

Genus 71. Ammocœtes, Duméril.

Brook Lampreys.

132. *Ammocœtes niger*, Raf.—Small Black Lamprey.

A small species, which we have found only in small streams in the northern part of the State. Especially abundant in spring, at the spawning season.

SUMMARY AND CONCLUSION.

The especial characteristics of the fish fauna of the State as distinguished from other zoölogical areas, are the preëminence of the Catostomidæ and the Siluridæ, (the suckers and the cat-fishes), and of the sunfishes, darters and minnows. The shovel-fish, the various species of gars, and the dog-fish are likewise among the characteristic features of our fauna, as is also the excessive abundance of the hickory shad.

The limited share of Illinois in Lake Michigan, not extending into water of more than twelve or fifteen fathoms, gives us but a small group of species peculiar to the great lakes, viz: the common white fish, the lake herring, the lake trout, the muskallunge and the burbot.

Numerical Data.

It will be seen that the fishes of Illinois, as shown by this list, represent 132 species, which are here distributed among 71 genera and 27 families.

A cursory summary, in popular terms, of the number of species by which each leading family is represented, will have its interest to the general reader.

The largest family of our fishes is the perches (Percidæ), including the sunfishes, darters, and true perch. It is represented in our fauna by thirty-eight species and sixteen genera, nearly half of which (eighteen species) are the little darters, while the sunfishes (seventeen species) include most of the remainder. The next largest family is that of the true minnows (Cyprinidæ), represented by thirty-three species, distributed among sixteen genera. There are twelve species of cat-fishes, four of them the small stone cats, rarely seen by fishermen, and thirteen of the sucker family, four of them buffalo fishes. The sea bass are represented by two species; the sheepshead by one; the fresh water sculpins by one, and the cod-fish family by but one, the burbot. There are three of the salmon family within our limits, all from the lake; one "blind" fish, one trout perch, four toothed minnows, three species of pike, and one each of the mud minnows, eels, sticklebacks, silversides, pirate perches and clossomes. The lampreys are represented by two species, the shovel-fish by one, the sturgeons by two and the gars by three. We have also the one dog-fish, two moon-eyes, one representative of the shad family, and the hickory shad.

DISTRIBUTION OF SPECIES.

A few brief notes respecting the peculiarities of distribution in Illinois will not be without interest. The extraordinary length of this State, from north to south, extending through nearly six degrees of latitude, the southern extremity lying in the southern (Austroriparian) zoölogical region, and the northeastern corner covering a portion of the Great Lake area, gives us an unusual number of species whose range does not extend throughout our territory; some being strictly southern, others as strictly northern, and still others extending their range from the north southward, or from the south northward, without actually reaching the opposite extremity of the State. For the purpose of presenting these facts of distribution in a compact and summary manner, I append lists of species peculiar to the different parts of Illinois, so far as our present knowledge extends, it being taken for granted, of course, that my references to distribution relate only to Illinois.

The first list includes those species which are found in the northern part of the State, and do not occur to the southward, meaning thereby those found in Illinois north of the Illinois River on the parallel of Ottawa and La Salle.

The second list includes those northern species which extend more or less to the southward, but do not reach the hilly region of Southern Illinois beyond the Big Muddy River, or the valley of the Wabash south of Vincennes.

The third list includes the Southern Illinois species, which extend northward beyond the limits of the region just mentioned, but do not pass the Illinois River to the north beyond La Salle and Ottawa.

The fourth and final list includes those species which are confined to Southern Illinois, as above limited.

Two species, *Notropis macrolepidotus* and *Oxygeneum pulverulentum*, have occurred in the central part of the State, but not in either extremity, but as these are represented only by single specimens each, this fact has no geographical significance.

Another species, *Umbra limi*, occurs in the two extremities of the State, but not in the center,—a peculiarity explained by the preference of the species for waters not occurring in Central Illinois.

NORTHERN.

Lota maculosa, Perca americana, Etheostoma eos, Etheostoma lineolatum, Etheostoma zonale, Hadropterus evides, Gasterosteus inconstans, Esox nobilior, Fundulus diaphanus, Salvelinus namaycush, Coregonus artedi, Coregonus clupeiformis, Hyodon alsoides, Squalius elongatus, Couesius prosthemius, Notropis anogenus, Hybognathus nubilus, Ammocœtes niger.

(*Eighteen species.*)

NORTHERN AND CENTRAL.

Lepomis gibbosus, Lepomis ischyrus, Labidesthes sicculus, Percopsis guttatus, Rhinichthys atronasus, Pimephales promelas, Catostomus teres.

(*Seven species.*)

SOUTHERN AND CENTRAL.

Roccus interruptus, Etheostoma asprigene, Hadropterus phoxocephalus, Lepomis notatus, Lepomis humilis, Lepomis symmetricus, Notropis jejunus, Notropis lutrensis, Placopharynx carinatus, Ictiobus cyprinellus, Ictalurus marmoratus, Litholepis tristœchus, Scaphirhynchops platyrhynchus, Polyodon spathula.

(*Fourteen species.*)

SOUTHERN.

Etheostoma fusiforme, Etheostoma flabellare, Diplesium blennioides, Lepomis garmani, Centrarchus macropterus, Elassoma zonatum, Gambusia patruelis, Chologaster papiliferus, Platygobio pallidus, Ericymba buccata.

(*Ten species.*)

ECONOMIC RELATIONS.

Our most valuable food fishes are found chiefly in the perch and salmon families: in the former the common perch, the sauger, (or "jack salmon"), the wall-eyed pike, the croppies, and the two black bass; and in the latter, the white-fish, the lake trout, and the lake herring.

But little inferior to the perches are the two principal members of the pike family—the common pike and the muskallunge. Inferior but always salable species are found among the cat-fishes, the

sucker family and the smaller sun-fishes—the larger species of the first and the three buffalo-fishes being more generally and widely marketed than all other species together. Our river carp, a nearly worthless fish, included with the suckers, is not at all to be confounded with the European carp, the two belonging, in fact, to different families. The sturgeon, the sheepshead, the white bass, the striped bass, most of our sun-fishes, and the burbot of the lakes are also generally eaten. Indeed, even the dog-fish and the shovel-fish are esteemed for food in some localities.

Briefly, we may say that of our one hundred and thirty-two native fishes, about twelve are of superior quality; six, at least,—the white-fish, the lake trout, the two pike perch and the two black bass, being among the best of all fresh water fishes. Eighteen others are of fair and always merchantable quality, and at least a dozen more are really to be classed as edible, although they are not always eaten.

Besides these forty or more directly useful species, nearly all the others are to be considered indirectly valuable, as affording indispensable food to the edible kinds, especially to the best of these, the most highly-prized game fishes. While it may be an open question whether some of the poorer food-fishes on our list do not more harm than good by appropriating food which would otherwise maintain a large number of their betters, the absolutely injurious species—those which inflict injury and render no benefit, direct or indirect, in return—are only the two lampreys and the three gars, the first being parasites and the others predaceous species which are never eaten themselves, either by fishes or by men.

I think that no one, with these facts in mind, can for a moment doubt that the native fish fauna of Illinois is well worthy of careful study and of most solicitous protection. Its value, present and prospective, now little understood, will become more and more evident as the people of the State become better educated in our local natural history, and will, in fact, rapidly appreciate as food becomes more costly, and as the intelligent and well-directed efforts of our State Fish Commission bear their necessary fruit. It is the writer's own opinion that the preservation and improvement of our native fishes, already adapted to our climate, waters, and peculiar conditions of life, afford a far more promising field of practical fish culture than the importation of foreign species, except, perhaps, the European carp.

Champaign, Ill., December 30, 1884.

THE FOOD OF FISHES.*

BY S. A. FORBES.

For a clear conception of the general and intricate interdependence of the different forms of organic life upon the earth, one can not do better than to study thoroughly the life of a permanent body of fresh water,—a river or smaller stream, or, better than these, a lake. The animals of such a body of water are, as a whole, curiously *isolated*,—closely related among themselves in all their interests, but so far independent of the life of the land about them that, if every terrestrial plant and animal were annihilated, it would doubtless be long before the general multitude of the inhabitants of the lake or stream would feel the effects of this event in any very important way.

Further, the greater difficulty of communication between the different parts of a water system as compared with the different regions of the land, is such that the former are much the more sharply limited. There is very much less interchange of all kinds between two branches of the same stream, for example, than between the tracts of land which they separate. Consequently, one finds in a single body of water a far more complete and independent equilibrium of organic life and activity than in any equal body of land. It forms a little world within itself,—a microcosm within which all the elemental forces are at work and the play of life goes on in full, but on so small a scale as to bring it easily within the mental grasp.

Nowhere can one see more clearly illustrated what may be called the *sensibility* of such an organic complex,—expressed by the fact that whatever affects any species belonging to it, must speedily have its influence of some sort upon the whole assemblage. He will thus be made to see the impossibility of studying any form successfully out of relation to the other forms,—the necessity for taking a comprehensive survey of the whole as a condition to a satisfactory understanding of any part. If one wishes to become acquainted with the black bass, for example, he will learn but little if he limits himself to that species. He must evidently study also the species upon which it depends for its existence, and the various conditions upon which *these* depend. He must likewise study the species with which it comes in competition, and the entire system of conditions affecting their prosperity. Leaving out any of these, he is like one who undertakes to make out the construction of a watch, but over-

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* From Bull. No. 3, Ill. State Lab. Nat. Hist., November, 1880.

looks one wheel; and by the time he has studied all these sufficiently, he will find that he has run through the whole complicated mechanism of the aquatic life of the locality, both animal and vegetable, of which his species forms but a single element.*

In such a general survey of the plants and animals of a region, the study of their food relations will be found to afford an admirable objective point. Doubtless, of all the features of the environment of an individual, none affect it at the same time so powerfully, so variously and so intimately as the elements of its food. Even climate, season, soil and the inorganic circumstances generally, influence an animal through its food quite as much as by their direct action. It is through the food relation that animals touch each other and the surrounding world at the greatest number of points, here they crowd upon each other the most closely, at this point the struggle for existence becomes sharpest and most deadly; and, finally, it is through the food relation almost entirely that animals are brought in contact with the material interests of man. Both for the student of science and for the economist, therefore, we find this subject of peculiar interest and value. It includes many of the most important relations of a species, and may properly be made the nucleus about which all the facts of its natural history are gathered.

In a paper on the food of Illinois fishes, published in the second bulletin of this Laboratory, the subject was treated in a general and cursory way, the amount of material upon which that paper was based being insufficient for exact or detailed description. The favor with which that preliminary notice was received, has made it possible to undertake a more serious investigation; and this paper contains an account of the food of the Acanthoptera of the State which I believe to be nearly or quite sufficient for the student of science and for the practical fish culturist. It is still necessary only to study the food of specimens under a half-inch in length, and to test the value of the general conclusions here reached, by occasional examinations of fishes taken from other waters at other seasons of the year. Among the results of this study, those relating to the food of the young are especially worthy of attention, and these have therefore been summed up separately.

The explanation of certain structural conditions about the mouth, throat and gills, has proceeded so far as to make it very likely that a number of definite general correspondences between structure and food will be made out, which will enable us to tell with considerable accuracy and detail what the food of an unknown fish must be, by a mere inspection of the fish itself; provided, of course, that we know what food is accessible to it in its habitat. It seems likely to prove to be a general rule that a fish makes scarcely more than a *mechanical* selection from the articles of food accessible to it, taking

*I can not too strongly emphasize the fact—frequently illustrated, I venture to hope, by the papers of this series—that a comprehensive survey of our entire natural history is absolutely essential to a good *working knowledge* of those parts of it which chiefly attract popular attention,—that is, its edible fishes, its injurious and beneficial insects, and its parasitic plants. Such a survey, however, should not stop with a study of the dead forms of Nature, ending in mere lists and descriptions. To have an *applicable* value, it must treat the life of the region as an organic unit, must study it *in action*, and direct principal attention to the laws of its activity.

almost indifferently whatever edible things the water contains which its habitual range and its peculiar alimentary apparatus enable it to appropriate, and eating of these in about the ratio of their relative abundance and the ease with which they can be appropriated at any time and place. If this is so, knowing the structure of a fish and the contents of a body of water, we shall be able to tell, *a priori*, what the fish will eat if placed therein.

This is, in fact, the objective point of the present investigation,—to arrive at a knowledge of the correlations of structure and food habits sufficiently detailed and exact to make the tedious and difficult labor of examining the contents of stomachs unnecessary hereafter. Some generalizations of this sort are given in the following pages, and others relate to genera not included in this report.

The method of this paper differs from that of the previous one referred to by the calculation of the *ratios* of the different kinds of food for each species or group of individuals. These ratios were obtained by averaging careful estimates of the relative amounts of the different food elements found in each stomach.

It is proposed to follow a similar method hereafter down through the remaining orders of the class. Most of the material has been collected for this purpose, and much of it has been already studied.

Order TELEOCEPHALI.

Suborder ACANTHOPTERI.

This suborder includes all Illinois fishes which have the anterior dorsal fin (where there are two) or the first rays of the dorsal (where there is but one) stiff, spinous and sharp, and united by an evident membrane; excepting only the remarkable "brook silversides," which is placed by Drs. Gill and Jordan in another group. It embraces all our game fishes except those belonging to the pickerel family (*Esocidæ*) and the salmon family (*Salmonidæ*). Its principal members are the darters, the various species of perch and bass, the sunfishes and the sheepshead. Forty-six species of the order have been collected in the State, but only thirty-four of these are common enough to form features of any importance in our fish fauna.

The most numerous family of the group is the *Centrarchidæ* (sunfishes); the most important species are the two kinds of black bass, the pike-perch or "wall-eyed pike,"* the common perch, the white bass, and the croppie or silver bass.

The following account of the food of this suborder is based upon the careful microscopic study of the contents of four hundred and twenty-five stomachs, representing six families, twenty genera† and thirty-three species.

*It is generally to be desired that the absurd names of "Salmon" and "Jack Salmon" for these species should be suppressed. They might as well be called suckers or catfishes or minnows, as far as accuracy is concerned. Common names are many times harder to kill than the cat of the proverb, however; and it is probable that unnumbered generations will continue to call the pike-perch "salmon"; the sunfishes, "perch"; and the black bass, "trout."

†The classification of this paper is substantially that of Jordan's Manual of the Vertebrates of North America, etc., Ed. 2, 1878.

These were all collected by myself or one of my assistants (Mr. W. H. Garman), and labeled at the time with name of species, locality and date. While the northern half of the State is most fully represented, several trips to Southern Illinois contributed to the material studied, and it is believed that the results arrived at are substantially true for our whole area.

Family ETHEOSTOMATIDÆ. The Darters.

What the humming-birds are in our avifauna, the "darters" are among our fresh-water fishes. Minute, agile, beautiful, delighting in the clear, swift waters of rocky streams, no group of fishes is more interesting to the collector; and in the present state of their classification, none will better repay his study. Notwithstanding their trivial size, they do not seem to be *dwarfed* so much as *concentrated* fishes—each carrying in its little body all the activity, spirit, grace, complexity of detail and perfection of finish to be found in a perch or a "wall-eyed pike."

They are generally distributed, in suitable streams throughout the State; but we have found them much the most abundant in Northern Illinois,—in the upper Galena river, in Yellow creek near Freeport, and in tributaries of the Kishwaukee at Belvidere.

A short and strong minnow-seine of very fine mesh is needed in collecting them. Rapid hauls, made almost on the run, down stream, in swift and shallow water, will be found the most successful. Two or three species, of wider range, will be taken in ordinary situations, in collecting for minnows generally; but the brightest and most characteristic forms can only be got by special effort.*

I shall give here a description of the food of the family, based upon the study of the contents of seventy stomachs representing fifteen species, collected in all parts of Illinois, in several months of four successive years. These indicate much more than their number would imply, since from those collected at each time and place as many were commonly studied as were necessary to give a full idea of the food of the species then and there. The different individuals from the same date and locality usually agreed so closely in food, that the study of from two to five gave all the facts obtainable from several times as many. The data here given, therefore, really exhibit the food of the family at different seasons in twenty-nine localities within the State.

The genus *Pleurolepis* is comparatively rare in Illinois, as there are few of the sandy streams in the State, which it inhabits. Seven individuals were examined—four of *P. pellucidus* and three of *P. asprellus*. The food of these specimens was remarkably uniform—the only elements found being the larvæ of small diptera and ephemerids. Eighty-one per cent. of the food of all consisted

* For a very entertaining and instructive account of these fishes, the reader is referred to papers in the American Naturalist, by Messrs. Jordan and Copeland, Vol. X, pp. 335-341, and Vol. XI, pp. 86-88.

of the larvæ of Chironomus*—a small, gnat-like insect,—twelve per cent. of the larvæ of other small diptera, and the remaining seven per cent. of ephemerid larvæ (May flies).

Twelve specimens of the genus *Alvordius* were studied—seven of *maculatus* and five of *phoxocephalus*. These represented five different localities and dates. This is a larger species than the preceding, and to this fact is probably due the preponderance (seventy-five per cent.) in its food of the larvæ and pupæ of May flies (Ephemeridæ). These included four per cent. of the larvæ of *Palingenia bilineata*, Say, one of the largest ephemerids in our streams. The remaining kinds were larvæ of dragon flies (Agrionidæ), four per cent.; larvæ of Chironomus, seven per cent., *Corixa tumida*, Uhl., thirteen per cent., and Cyclops, one per cent.

The genus *Boleosoma*, regarded by Dr. Jordan as the typical darter, was represented by twelve specimens from eight localities—nine of *maculatum*, two of *olmstedi* and one of *camurum*.† These specimens show but slight food differences from other darters of similar size; the only notable variation being the appearance of fifteen per cent. of case-worms (larvæ of Phryganeidæ). Sixty-five per cent. of the food was Chironomus larvæ, seven per cent. larvæ of other minute diptera, and the remaining twelve per cent. was larvæ of small ephemerids, and a few Cyclops.

I studied the food of two specimens of *Pœcilichthys variatus*, four of *P. spectabilis* and two of *P. asprigenis*—making eight of the genus, representing six localities. Fifty-eight per cent. of small larvæ of diptera (forty-nine per cent of Chironomus), thirty-two per cent. of larvæ and pupæ of small ephemerids, and ten per cent. of case-worms made up the entire bill of fare.

Percina caprodes, the largest of the group, departs from all the foregoing species by the prominence given to crustacean food—thirty per cent of Entomostraca and three per cent. the smallest of our Amphipoda, *Allorchestes dentata*, (Smith) Faxon. Most of the Entomostraca were *Cladocera*, including Daphnia, Eurycercus and Daphnella.‡

Here occurred the only instance of molluscan food in the group. One specimen had taken a few individuals of *Ancylus rivularis*, Say. Reduced ratios of Chironomus and ephemerid larvæ, and a few *Corixa tumida* complete the list.

Of *Nanostoma zonale*, less common than the others, but two individuals were examined, and these had eaten nothing but larvæ of small diptera, including sixty-five per cent. of Chironomus.

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*The larvæ of Chironomus are among the most important elements of fish food in our waters, appearing in abundance in the stomachs of the young of a great variety of species. They have been too little studied in this country to allow specific determination.

† *Boleosoma maculatum* and *B. olmstedi* should undoubtedly be united. Specimens in the laboratory collection present the extremes of both forms, together with numerous intermediate stages of each character used to distinguish them.
This whole group exhibits a surprising variability, perhaps due to its comparatively recent origin

‡ Daphnelia was found in a Percina from the Calumet River, at South Chicago, but not in condition to permit the determination of the species.

Six specimens of *Etheostoma flabellare* var. *lineolata*, from four localities, had eaten sixty-one per cent. of Chironomus larvæ, twenty-seven per cent. larvæ of small ephemerids, and twelve per cent. of Copepoda (Cyclops).

Bolcichthys elegans, found only in the southern part of the State (three specimens examined), had eaten only dipterous larvæ (thirty-seven per cent.) and ephemerid larvæ (sixty-three per cent.). This is a larger, heavier species than most of the others, and, therefore, like Alvordius, prefers ephemerids to gnats.

Last and least comes *Microperca punctulata*, represented by nine specimens from four localities in Northern Illinois. This smallest of the darters shares with Percina, the largest, the peculiarity of a large ratio of crustacean food, which made up sixty-four per cent. of the total. The principal kinds were Cyclops, Chydorus, young *Gammarus fasciatus*, Say, and young *Crangonyx gracilis*, Smith. The remaining elements were Chironomus larvæ (thirty-four per cent.) and a trace of ephemerids (two per cent.).

It will be seen that the family, taken as a whole, divides into two sections, distinguished by the abundance or deficiency of crustacean food. This is easily explained by the fact that Percina and Microperca range much more freely than the other genera—being frequently found among weeds and Algæ in comparatively slow water with muddy bottom, while the others are rather closely confined to swift and rocky shallows.

In discussing the food of the whole group, taken as a unit, it may best be compared with the food of the young of other percoids. It is thus seen to be remarkable for the predominance of the larvæ of Chironomus and small Ephemeridæ—the former of these comprising forty-four per cent. and the latter twenty-three per cent. of the whole food of the seventy specimens. In young black bass (*Micropterus pallidus*), on the other hand, the averages of nine specimens, ranging from five-eighths inch to one and a half inches in length, were, in general terms, as follows: Cladocera forty-two per cent., Copepoda seven per cent., young fishes twenty per cent., Corixa and young Notonecta twenty-nine per cent., and larval Chironomus only two per cent. The search for the cause of this difference leads naturally to an examination of the whole economy of these little fishes, and opens up the question of their origin as a group.

The close relation of the Etheostomatidæ to the Percidæ requires us to believe that the two groups have but recently diverged, if, indeed, they are yet distinctly separate.

We must inquire, therefore, into the causes which have operated upon a group of percoids to limit their range to such apparently unfavorable situations, to diminish their size, to develop unduly the paired fins and reduce the air-bladder, to remove the scales of several species more or less completely from the head, breast, neck and ventral region, and to restrict their food chiefly to the few forms mentioned above.

No species can long maintain itself anywhere which can not, in some way, find a sufficient supply of food, and also protect itself against its enemies. In the contest with its enemies it may acquire

defensive structures or powers of escape sufficient for its protection, or a reproductive capacity which will compensate for large losses, or it may become adapted to some place of refuge where other fishes will not follow. What better refuge could a harassed fish desire than the hiding-places among stones in the shallows of a stream, where the water dashes ceaselessly by with a swiftness few fish can stem? And if, at the same time, the refugee develops a swimming power which enables it to dart like a flash against the strongest current, its safety would seem to be insured. But what food could it find in such a place? Let us turn over the stones in such a stream, sweeping the roiled water at the same time with a small cloth net, and we shall find—larvæ of Chironomus and small Ephemerids and other such prey, and little else; food too minute and difficult of access to support a large fish, but answering very well if our immigrant *can keep down his size*. Here the principles of natural selection assert their power. The limited supply of food early arrests the growth of the young; while every fish which passes the allowable maximum is forced for food to brave the dangers of the deeper waters, where the chances are that it falls a prey. On the other hand, the smaller the size of those which escape this alternative, the less likely will they be to attract the appetite of the small gar or other guerilla which may occasionally raid their retreat, and the more easily will they slip about under stones in search of their microscopic game.*

Like other fishes, the darters must have their periods of repose, all the more urgent because of the constant struggle with the swift current which their habitat imposes. Shut out from the deep still pools and slow eddies where the larger species lurk, they are forced to spend their leisure on or beneath the bottom of the stream, resting on their extended pectorals and anal, or wholly buried in the sand. Possibly this fact is correlated with the absence or rudimentary condition of the air-bladder; as it is a rule with many exceptions—but still, probably, a rule—that this organ is wanting in fishes which live chiefly at the bottom.

Doubtless the search for food has much to do with this selection in a habitat. I have found that the young of nearly all species of our fresh-water fishes are competitors for food, feeding almost entirely on Entomostraca and the larvæ of minute diptera.† As a tree sends out its roots in all directions in search of nourishment, so each of the larger divisions of animals extends its various groups into every place where available food occurs, each group becoming adapted to the special features of its situation. Given this supply of certain kinds of food, nearly inaccessible to the ordinary fish, it is to be expected that some fishes would become especially fitted to its utilization. Thus the Etheostomatidæ as a group are explained, in a word, by the hypothesis of the progressive adaptation of the young of certain Percidæ to a peculiar place of refuge and a peculiarly situated food supply.

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*In Boleosoma, which is normally scaled in front of the dorsal fin, we often find the skin of this region bare in large specimens, and showing evident signs of rubbing.

†Several of the Catostomidæ (suckers) are an exception to this rule, feeding when young chiefly on Algæ and Protozoa.

Perhaps we may, without violence, call these the mountaineers among fishes. Forced from the populous and fertile valleys of the river beds and lake bottoms, they have taken refuge from their enemies in the rocky highlands where the free waters play in ceaseless torrents, and there they have wrested from stubborn nature a meagre living. Although diminished in size by their continual struggle with the elements, they have developed an activity and hardihood, a vigor of life and glow of high color almost unknown among the easier livers of the lower lands.

The appended table will facilitate a comparison of the records of the different genera. The percentages were obtained by estimating carefully the ratios of each element of the food of each individual, and averaging these ratios for all the individuals of a species:

DETAILS OF THE FOOD OF THE ETHEOSTOMATIDÆ.

	Pleurolepis	Alvordius	Boleosoma	Poecilichthys	Percina	Nanostoma	Etheostoma	Boleichthys	Microperca
Number of specimens	7	12	12	8	11	2	6	3	9
I. MOLLUSCA	---	---	---	---	01	---	---	---	---
Ancylus rivularis, Say	---	---	---	---	01	---	---	---	---
II. INSECTA	100	99	96	100	65	100	88	100	36
1. *Diptera*	93	07	73	58	43	100	61	37	34
Undetermined larvæ	12	01	07	09	02	35	---	10	---
Chironomus larvæ	81	06	66	49	41	65	61	27	34
2. *Hemiptera*,	---	13	---	---	05	---	---	---	---
Corixa	---	13	---	---	05	---	---	---	---
Undetermined	---	---	---	---	03	---	---	---	---
Larvæ	---	07	---	---	02	---	---	---	---
C. lumida, Uhl.	---	06	---	---	---	---	---	---	---
3. *Neuroptera*	07	79	23	42	17	---	27	63	02
Ephemeridæ	07	75	08	32	09	---	27	63	02
Pupæ	---	08	---	14	---	---	---	---	---
Larvæ	07	63	08	18	09	---	27	63	02
Palingenia	---	04	---	---	---	---	---	---	---
Agrionidæ (pupæ)	---	04	---	---	---	---	---	---	---
Phryganeidæ (larvæ)	---	---	15	10	08	---	---	---	---
III. CRUSTACEA	---	01	04	---	33	---	12	---	64
1. *Amphipoda*	---	---	---	---	03	---	---	---	12
Gammarus, yg	---	---	---	---	---	---	---	---	06
Crangonyx "	---	---	---	---	---	---	---	---	06
Allorchestes dentata, Sm	---	---	---	---	03	---	---	---	---
2. *Cladocera*	---	---	---	---	24	---	---	---	27
Undetermined	---	---	---	---	05	---	---	---	---
Daphniidæ	---	---	---	---	06	---	---	---	---
Daphnia	---	---	---	---	07	---	---	---	---
Sididæ	---	---	---	---	05	---	---	---	---
Daphnella	---	---	---	---	05	---	---	---	---
Lynceidæ	---	---	---	---	01	---	---	---	03
Chydorus	---	---	---	---	---	---	---	---	24
Eurycereus	---	---	---	---	01	---	---	---	---
3. *Ostracoda*	---	---	---	---	01	---	---	---	---
Cyprididæ	---	---	---	---	01	---	---	---	06
Undetermined.	---	---	---	---	01	---	---	---	06
4. *Copepoda*	---	01	04	---	05	---	12	---	19
Cyclops	---	01	04	---	05	---	12	---	19
Confervoid Algæ	---	---	---	---	01	---	---	---	---

Family PERCIDÆ. The Perches.

This family consists, in this State, of three species,—the common yellow perch and the two species of pike-perch or "wall-eyed pike." I have examined the food of seventy-five specimens of this family, so distributed in time and space as to give a satisfactory idea of the usual food.

Perca americana, Schrank. The Common Perch. Ringed Perch.

This exceedingly well-known species is most abundant along the shores of Lake Michigan and in the small streams and lakes of the northeastern part of the State, becoming less common to the south and west. In the Illinois river at Peoria and Henry it occurs in limited numbers, but in Southern Illinois disappears so completely that even its name (there generally pronounced "pearch") is transferred to a different family, the sun-fishes (Centrarchidæ).

My knowledge of the food of this species is derived from the study of the contents of forty-nine stomachs, of which thirty were from adults and the remaining nineteen from fishes ranging $\frac{3}{16}$ inch to four inches in length. Ten localities and as many dates are represented by these specimens. Some were taken in the Illinois river, others in Lake Michigan and its southern tributaries, and still others in Fox river, at McHenry, and in the lakes connected with that stream. One lot included in these notes was bought in the Chicago market. They were evidently of the river form of the species, and, judging from the contents of their stomachs, which included a crustacean* not known to occur in Illinois, but found abundantly in Michigan, I conclude that they were from that State or from Wisconsin.

Food of the Young.

Finding that the food of most fishes differs with age, I have grouped the young according to size, and averaged the food for each group separately,—the first group consisting usually of those under an inch in length, the second of those from one to two, etc.

Two perch under an inch in length had eaten nothing but Entomostraca,—about equal quantities of Cyclops and Daphnias. It was not until the specimens reached an inch and a half in length that insects of any considerable size appeared in the food. A single smaller fish had eaten a few minute larvæ of Chironomus, but otherwise the food at this age consisted wholly of Entomostraca.

About thirty-four per cent. of the food of nine specimens ranging from $1\frac{1}{8}$ to 2 inches in length consisted of insects, and sixty-six per cent. of crustaceans. The only insects recognized were the larvæ and pupæ of Chironomus (eleven per cent.), small water bugs—*Corixa tumida*, Uhl., *C. alternata*, Say, etc. (twenty-three per cent.), and a trace of larvæ of May-flies (Ephemeridæ). The Crustacea were chiefly Cladocera and Copepoda—thirty-six per cent. and twenty-

Mancasellus tenax, Harger.

four per cent. respectively. Four of the nine had eaten small quantities of a small amphipod crustacean, *Allorchestes dentata*, which is very abundant north, and has, in fact, about the same distribution in the State as the perch itself. The Cladocera were chiefly Daphniidæ (twenty-seven per cent.) including *Daphnia pulex*, L., *Simocephalus americanus*, Birge, and *Bosmina longirostris*. Specimens of Chydorus and Pleuroxus made up the principal part of the nine per cent. of Lynceidæ eaten. The Copepoda were all Cyclops and Diaptomus.

Four specimens two and a half inches long, all taken at Peoria, in November, 1878, had eaten nothing but Hemiptera (twelve per cent.) and Neuroptera (eighty-eight per cent.). The Hemiptera were all *Corixa alternata*, and the Neuroptera were nearly all the extremely common larva of one of our most abundant Mayflies (*Palingenia bilineata*, Say). Larvæ of small dragon-flies (Agrionini) made five per cent. of the food. The simplicity of the food of these specimens is probably due partly to the fact that they were all caught at the same time and place, and partly to the wintry weather when they were taken.

Four specimens, from three and a half to four inches long, representing two localities and dates, had eaten a greater variety of articles; the food, in fact, now closely approaching that of the adult. Forty-five per cent. of the food was insects,—chiefly larvæ of May-flies—and fifty-five per cent. Crustacea,—chiefly Amphipoda and Cladocera. Other insect elements were larvæ of Chironomus, six per cent., and four per cent. Corixas. The Cladocera were all Daphnia, and the Amphipoda were *Allorchestes dentata*. A single specimen from Long L., near Pekin, Ill., had eaten an isopod crustacean (Asellus). Cyprididæ, another family of minute crustaceans, formed eight per cent. of the whole food of these specimens.

Food of the Adult.

The thirty mature individuals may best be treated in two groups, the first from streams and the second from Lake Michigan.

Four of the first group were bought in the Chicago market, in March, 1880; six were taken from the upper Fox, in May; four were from Calumet R. at South Chicago, taken in August, 1878, and four were caught in October of that year, from the Illinois at Peoria.

We notice, first, the entire disappearance of Entomostraca, which are thus seen to be food proper to the young. We next observe the appearance of mollusca (nineteen per cent.), which are evidently no insignificant food resource of the species. Unio, Cyclas, Succinea, *Physa heterostropha*, Say, and *Valvata tricarinata*, Say, are the mollusks recognized. Notwithstanding the lack of Entomostraca, Crustacea are the most important resource of these river specimens,—constituting forty-eight per cent. of their food. Crawfishes (Cambarus) and our common little fresh-water shrimp (*Palæmonetes exilipes*, St.) compose ten per cent. of the whole; the previously noticed Allorchestes amounts to fifteen per cent., and species of Asellus, and *Mancasellus tenax* to twenty-three per cent. The Mancaselli were all

from the specimens from the Chicago market. Insects are also an important item,—amounting to twenty-four per cent., nearly all being the larvæ of Neuroptera,—May-flies (Ephemeridæ), dragon-flies, and case-flies (Phryganeidæ). A single specimen from Peoria Lake had eaten one small fish—a "darter" of the genus Pœcilichthys.

The second group, of twelve specimens from Lake Michigan, presents a curious and instructive contrast in food to the foregoing. Mollusks and insects wholly disappear, and Crustacea are limited to the commonest crawfish of the lakes (*Cambarus virilis*, Hagen), which forms fourteen per cent. of the food. The remaining eighty-six per cent. consisted wholly of fishes, all minnows (Cyprinidæ) as far as recognized except one, and that was some undetermined percoid,—probably itself a perch.

It will thus be seen that the common perch has a food history of three periods,—the periods of infancy, youth, and mature age. In the first it lives wholly on Entomostraca and the minutest larvæ of Diptera; in the second, commencing when the fish is about an inch and a half in length, it takes up first the smaller and then the larger kinds of aquatic insects in gradually increasing ratio, the entomostracan food at the same time diminishing in importance; and in the third it appropriates, in addition, mollusks, crawfishes and fishes—in the lake specimens depending almost wholly on the last two elements.

We have here the first instance of a fact which we shall see again and again illustrated—that the young, having at first an alimentary apparatus too small and delicate to dispose of any insects but the minutest larvæ, live almost wholly on minute crustaceans.

It is proper to note that the lake and river perch are by some good authorities regarded as separate species—the latter being much more highly colored than the former. I have not found so strict a separation of the two forms as that described by Mr. E. W. Nelson, but have frequently taken both in the same haul of the seine in different parts of Calumet R. and in Lake George, Ind.,—a body of water communicating with Lake Michigan by an outlet three or four miles long. Occasional pale specimens are also taken far from the lakes, in the Fox and Illinois Rivers. The difference of color is probably due partly to the smaller amount of light to which those inhabiting the deeper waters of the lake are exposed, and partly to their piscivorous habit combined with the comparatively few lurking-places afforded them. There is some evidence that fish food bleaches a fish directly, and a good deal that it does so indirectly, by increasing the importance of an inconspicuous appearance.

STIZOSTETHIUM CANADENSE, Smith. GRAY PIKE-PERCH. SAUGER. "JACK SALMON."

Fourteen specimens of this excellent fish were examined, all of which were from the Illinois R., ten taken in October, 1878, one in June, 1877, and three in November, 1877. It is evidently a very destructive species. These specimens had eaten nothing but fishes.

In three cases these were unrecognizable, and in two others I could only tell that they were Acanthopteri. Four of the remaining "Pike" had eaten hickory shad (*Dorysoma cepedianum*), two had eaten catfish (Siluridæ) of which one was an Amiurus, two had eaten sheepshead (*Haploidonotus grunniens*), and one had taken a black bass and some sunfish (Centrarchidæ). The presence in the stomach of one of these fishes, of a catfish of medium size, with its poisonous pectoral and dorsal spines unbroken, was a striking illustration of the gastric energy of this species.

Stizostethium vitreum, Mitch. Pike-Perch. Wall-eyed Pike. "Salmon."

This is far the finest of our river fishes,—second to no fresh-water species except, possibly, some of the salmon family. It occurs in the great lakes, and throughout the State generally in the larger streams. It is a much larger fish than the preceding, not unfrequently reaching a weight of twenty pounds. Certainly no fish of our waters is better deserving of attention than this. The only drawback to its increase is its voracity; but, although it devours an immense number of other fishes, there is no evidence that it is wantonly destructive or that it eats more in proportion to its weight than the black bass.

Twelve of this species were examined, two of which were under three inches in length, and the others adult.

Food of the Young.

A specimen two inches long, taken in the Illinois R., at Pekin, June 3, 1880, had eaten only a minute fish. One two and a half inches long, taken at the same place in June, 1878, had also eaten a small fish and a few Entomostraca (Cypridida and Daphniidæ). The appearance of these Entomostraca in the food of a fish of this size, makes it altogether probable that Stizostethium, like Perca, wholly depends on these minute Crustacea, when very young.

Food of the Adult.

The remaining specimens, taken from three localities, had eaten nothing but fishes, one half of them only the hickory shad or skipjack (*Dorysoma cepedianum*). In one other specimen, this species was associated with a minnow (Cyprinidæ), and in still another with a small sunfish with three anal spines (Centrarchidæ). One of the remaining stomachs contained only an unrecognizable fish, and the other two contained Cyprinidæ, including the creek chub, *Semotilus corporalis*.

The two species of this genus agree so closely in food that they may well be discussed together. Apart from their exclusively piscivorous habit, the most interesting fact shown is the importance of the hickory shad as food for this fish. We shall find accumulating evidence that this shad, utterly useless for human food, is, notwithstanding, one of the most valuable fishes in our streams. Nevertheless, not the slightest attention is paid to its preservation, much

less to its encouragement. The fishermen commonly regard these fishes as a mere nuisance, and leave them to die on the bank by hundreds, rather than take the trouble to return them to the water. They are a very delicate species, and are easily killed by rough handling in the seine, but the majority of those captured might be saved with a little care.

The abundance of these fishes as compared with some other species in the river might seem to indicate that they are common enough as it is. Few realize, however, the number of fishes needed to feed a pike-perch to maturity. Two or three items from my notes will furnish the basis for an intelligent estimate of this number.

From the stomach of a *Stizostethium canadense* caught in Peoria Lake, October 27, 1878, I took ten well-preserved specimens of *Dorysoma*, each from three to four inches long; and from a *Stizostethium vitreum* I took seven of the same species, none under four inches in length. As the Dorysoma is a very thin, high fish, with a serrate belly, these were as large as a pike-perch can well swallow; and we may safely suppose that not less than five of this species would make a full meal for the pike-perch. The species is a very active hunter, and it is not at all probable that one can live and thrive on less than three such meals a week. The specimens above mentioned were taken in cold autumn weather, when most other fishes were eating but little; but, since fishes generally take relatively little food in winter, we will suppose that the pike-perch eats, during the year, on an average, at this rate per week for forty weeks, giving us a total *per annum* of six hundred Dorysomas destroyed by one pike-perch. We can not reckon the average life of a Stizostethium at less than three years, and it is probable nearly five. The smallest estimate we can reasonably make as the food of each pike-perch would therefore be somewhere between eighteen hundred and three thousand fishes like Dorysoma. A hundred pike-perch, such as should be taken each year along a few miles of river like the Illinois, would therefore require one hundred and eighty thousand to three hundred thousand fishes for their food. Finally, when we take into account that a number of other species also prey upon Dorysoma, and that the whole number destroyed in all ways must not exceed the mere *surplus* reproduced—otherwise the species would be extinguished,—we can form some approximate idea of the multitudes in which the food species must abound if we would support any great number of predaceous fishes. Dorysoma, being a mud-eater and a vegetarian, taking animal food only during the Entmostracan period, can probabry be more readily maintained in large numbers in our muddy streams than any other fish.

It is evident that the increase of edible fishes without a corresponding supply of food will be largely time and labor thrown away. Probably if protected from wanton and ignorant destruction, the Dorysoma would abound sufficiently, as it is enormously prolific.

The following table is similar to that given for the preceding family. The mark + is used to indicate the occurrence of an element in too small an amount to figure in the ratios:

Table of the Food of the Percidæ.

	Perca.						Stizostethium.
	One inch and under.	One to two inches.	Two to three inches.	Three to four inches.	River specimens.	Lake specimens.	
Number of specimens examined	2	9	4	4	18	12	26
I. Fishes					06	86	100
Undetermined						50	23
Acanthopteri						08	21
Undetermined						08	08
Pœcilichthys					06		
Centrarchidæ							05
Undetermined							03
Micropterus							02
Haploidonotus							08
Dorysoma							41
Cyprinidæ						36	09
Undetermined						28	05
Semotilus							04
Siluridæ							08
Undetermined							04
Amiurus							04
II. Mollusca					19		
Physa heterostropha				†	05		
Succinea					04		
Valvata 3-carinata					01		
Cyclas					05		
Unio					04		
III. Insecta		34	100	45	24		
Pupæ					†		
1. *Diptera* (larvæ)		10		06	01		
Undetermined		01					
Chironomus		09		06	01		
2. *Hemiptera*		23	12	04			
Corixa		23		04			
Undetermined		11		04			
C. alternata			12				
C. tumida		12					
3. *Neuroptera* (larvæ)		01	88	35	23		
Ephemeridæ		01	83	35	08		
Undetermined				35	03		
Palingenia			83		05		
Agrionidæ			05		04		
Libellulidæ					08		
Phryganeidæ					03		
IV. Crustacea		66		55	48	14	†
1. *Decapoda*					10	14	
Cambarus					04	14	
Palæmonetes					06		
2. *Amphipoda*		06		24	15		
Undetermined		02					
Allorchestes		04		24	15		
3. *Isopoda*				01	23		
Asellus				01	11		
Mancasellus					12		
4. *Entomostraca*	100	60		30			†
Cladocera	55	36		22			
Daphniidæ	55	27		22			†
Undetermined	55	13					†
Simocephalus		†					
Daphnia		12		22			
Bosmina		02					
Lynceidæ		09					
Undetermined		07					
Pleuroxus		†					
Chydorus	†	02					
Copepoda	45	24					
Cyclops	45	24					
Diaptomus		†					
Ostracoda (Cypris)		†		08			†
V. Vegetation					03		

Family LABRACIDÆ. The Bass.

We have but two species of this family, the white bass and the brassy bass (*Roccus chrysops* and *Morone interrupta*). As far as their food is concerned, these are evidently equivalent species, agreeing closely in their general relations, and differing only in their distribution.

Roccus chrysops, Raf. White Bass.

This species is of medium abundance throughout the northern half of the State,—most common in Lake Michigan. A curious fact of its distribution is its rarity in Fox River and the lakes connected with that stream. Indeed, during several days' active collecting in this region we did not see a single specimen, neither could we hear of the occurrence of the species in those waters, although we made careful inquiry for it among experienced fishermen.

My notes on its food relate only to eleven specimens, of which three, taken at South Chicago, in August, were young, but of unknown size. Two of these had eaten only Chironomus larvæ and the larvæ of a remarkable ephemerid? not yet determined, and the stomach of the third contained only a minute fish. The remaining eight individuals had depended chiefly on the larvæ of May-flies (sixty-nine per cent.). The other important articles of their food were twenty per cent. fishes (including one sun-fish—Centrarchidæ) and eight per cent. isopod Crustacea (Asellus). Several attempts to secure food from Lake Michigan specimens were unsuccessful, as, being taken in pound-nets, their stomachs were always empty. Those studied were from various interior situations in the northern third of the State.

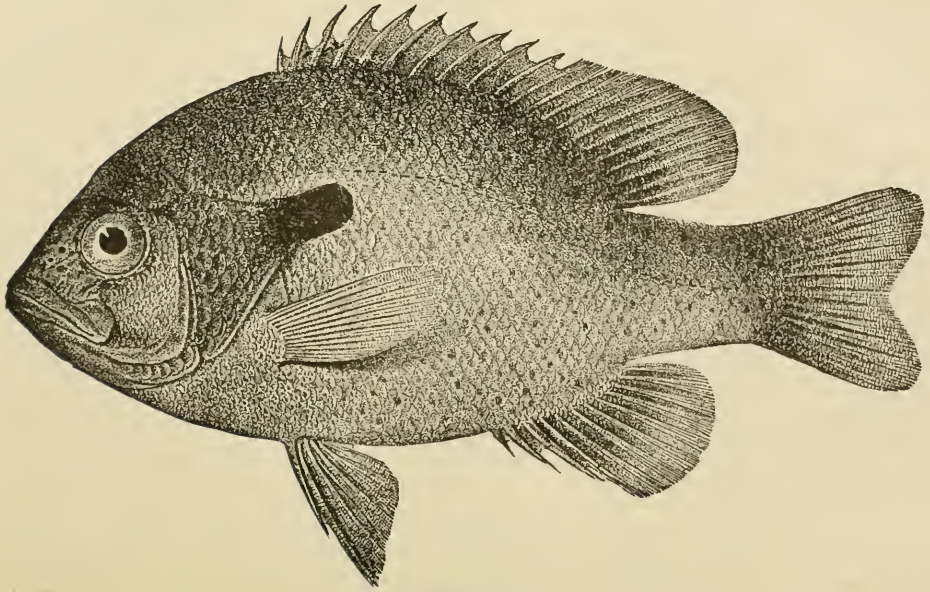
Morone interrupta, Gill. Striped Bass. Brassy Bass.

This fish replaces the preceding in the southern half of the State, the Illinois River forming a neutral zone between the respective territories of the two species.

The food of six specimens of this species was studied, all taken from the Illinois River from May to October.

Four of these were young. The smallest, one and a fourth inches long, taken at Peoria, in June, 1878, had eaten about equally of small *Dorysoma cepedianum* and Entomostraca,—forty per cent. Leptodora and ten per cent. Cyclops. One, an inch and a half in length, taken at the same time and place, had eaten only Dorysoma, with a trace of Cyclops. The next, one and five-eighths inches in length, had eaten a small undetermined fish and a few Daphnias. The fourth, one and seven-eighths inches long, caught at Peoria, in October, had eaten only larvæ and pupæ of Chironomus.

The two adult specimens were feeding chiefly upon the larvæ of Neuroptera,—especially May-flies. An *Allorchestes dentata* and a few small grasshoppers also appeared in the food.



SUN FISH.

It will be seen that this species apparently agrees closely with the preceding in its food. The large amount of crustacean food in the smallest specimen shows that we should probably find still smaller Labracidæ depending upon these as strictly as the Percidæ.

Family CENTRARCHIDÆ. The Sun-fishes.

This interesting group, known, in some of its members, to every one who has ever seen a dozen fishes, is represented, in Illinois, by sixteen species, as the species of this family are now understood. The two black bass, included in this family for technical reasons, are, of course, the most important species. The rock bass, the croppie and the common sun-fish (*Lepiopomus pallidus*), although not fishes of the first class, would be seriously missed if we were to lose them; and boyhood in the country would be quite another thing if it were not for the "pumpkin seed" in the mill-pond, whose barbaric splendor thrills the heart of the youthful fisherman as the more delicate beauties of the trout or salmon do those of tougher fibre.

I have studied the food of thirteen species of this group, as indicated by two hundred and thirty-seven specimens, well distributed in time and area.

Decided differences in food made out in the various genera, have been found to coincide with differences in a few structures about the mouth in such a way that one may predict, from an examination of these structures, what the leading peculiarities of the average food of any genus will be.

Micropterus pallidus, Raf. Large-mouthed Black Bass.

This famous species is too well known to require extended comment. The ordinary fishermen rarely distinguish it from the following; and, indeed, sportsmen do not always recognize the difference.

I have examined the food of thirty-one specimens of this species, fourteen of which were adults, and the remainder young, of different ages.

Food of the Young.

The first group, consisting of five specimens under one inch in length (ranging from $\frac{5}{8}$ to $\frac{3}{4}$ in.), represent three localities,—Crystal Lake, in McHenry county, the Illinois River at Pekin, Tazewell county, and the same stream at Starved Rock, in LaSalle county. They were taken in June, July and August of three different years. It is evident, therefore, that the common features of their food can not well be attributed to any other fact than their similar size.

The entire food of these fishes consisted of small Crustacea,—all Entomostraca except seven per cent., eaten by a single fish, which consisted of the very young of some undetermined amphipod,—probably Allorchestes. Eighty-seven per cent. of the food was Cladocera, principally *Bosmina longirostris*, Müll. *Simocephalus*

americanus, Birge, was also an important element; and traces appear of Chydorus, Pleuroxus and *Eurycercus lamellatus*. About six per cent. of Cyclops had been eaten.

In the food of the next group—six specimens, from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches long—minute fishes and insects appear. The fishes (twenty-nine per cent.) were not large enough to determine. The insects (forty-six per cent.) were mostly young water bugs (Corixa), the principal part of which were about half grown. The adults were all *Corixa tumida*, Uhl. The Entomostraca drop to twenty-five per cent., about equally Cladocera and Cyclops. Among the former were many specimens of *Simocephalus americanus*, and a few of the rare and curious Leptodora mentioned in a previous paper.* The specimen in which this was found was taken at Peoria, in June, 1878. All of this group were taken from the Illinois River, but at different places and dates. Some, taken at the same place and time as others of the preceding group, differed from them in the smaller number of Entomostraca eaten, and the larger number of insects,—differences evidently only to be explained as due to the different sizes of the fishes.

The next two specimens, between two and three inches long, had eaten only insects, chiefly *Corixa tumida*.

Four specimens, ranging from three to three and a half inches in length, all taken from a lake in the Illinois River bottom, in October, 1879, had eaten nothing but insects,—almost wholly Corixas and the larvæ of May-flies (Ephemeridæ). The Corixas were *C. alternata*, Say, and *C. tumida*, Uhl.

Food of the Adult.

Turning to the food of the fourteen adults, we note the total disappearance of Entomostraca, the merely accidental occurrence of insects, the appearance of crawfishes (*Cambarus immunis*), which amount to seven per cent. of the whole food, and the great predominance of fishes (eighty-six per cent.). These were of sufficient variety to show that no group is safe from the appetite of the bass unless it be the gar.

Perch, minnows, catfish and hickory shad were recognizable. The last were much the most abundant, occurring in eight of the specimens, and constituting fifty-eight per cent. of the food of the whole number. They ranged from three to six in each stomach, and were from three to four inches long. It should be noted, however, that these were all eaten by fishes taken at the same place and time. A large mouse was found in the stomach of one bass from the Illinois River.

We may generalize these data by saying that this black bass lives, at first, wholly on Entomostraca; that it commences to take the smallest aquatic insects when about an inch in length, and that minute fishes appear in its diet almost as early. From this forward, the Entomostraca diminish in importance, and the insects and fishes

* See Bull. No. 2. Ill. State Lab. Nat. Hist., p. 88.

become larger and more abundant in the food. The adults eat voraciously of a great variety of fishes--especially the hickory shad (Dorysoma),—and feed upon crawfishes also to some extent.

Micropterus salmoides, Lac. Small-Mouthed Black Bass.

This species, called also tiger bass, river bass, etc., is the black bass, *par excellence*. It ranges, usually, in deeper and clearer water than the preceding; but both are often taken together.

I have made full notes of the food of twenty-seven specimens,—three adult and the others young. I had none of this species under an inch in length; but, judging from the general resemblance of the food of this and the preceding bass at later ages, I do not doubt that this will also be found to feed at first on Entomostraca, although insect food is possibly more important to it from the beginning.

Seven individuals, from one to two inches in length, were all taken in July from rocky ripples in the Fox River, at Dayton, Ill., a few miles above the mouth of the stream. These had eaten only five per cent. of Entomostraca,—the whole remainder of the food consisting of insects, of which *Corixa tumida*, young and adult, and larvæ of May-flies and darning-needles (Agrionidæ) were the most important kinds. Four per cent. of the larvæ of Chironomus are worthy of notice. The scarcity of Entomostraca in the food of fishes as small as these is probably due to the situation in which these specimens occurred, as few Entomostraca are to be found in swift water. The same fact will account for the presence of Chironomus larvæ,—found abundantly under stones in rapid streams.

The next ten specimens, between two and three inches long, were taken in July, partly at the same place as the preceding, and partly from the Illinois River, a few miles below the mouth of the Fox. These differed from the smaller specimens chiefly in the appearance of fishes in the food (five per cent.) and in the absence of Neuroptera. Probably the last of these differences, at least, was accidental. A few larvæ of aquatic Coleoptera (Hydrophilidæ and Dytiscidæ) were noticed. Corixas, including *C. tumida*, Uhl., and *C. signata*, Fieb.,* amounted to eighty-two per cent. of the food.

In those ranging from three to four inches in length (seven individuals), the fishes eaten rise to fourteen per cent., but the insects drop away to seven per cent., and the Crustacea rise to seventy-nine. Here, however, difference of locality interferes to prevent any satisfactory comparison with other ages,—as these specimens were all taken in August, from Calumet River, at South Chicago. This slow stream, clogged with Algæ and a great variety of other aquatic plants in midsummer, also swarms with Crustacea,—especially the little *Allorchestes dentata*. This species made sixty-three per cent. of the food of these specimens; and an undetermined species of Asellus, fourteen per cent. A few *Gammarus fasciatus* were also found. The insects were Corixa and larvæ of Agrionidæ.

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*Determined by Mr. Uhler.

It will be seen that, excepting the gradual increase of the number of fishes eaten, these data show no especial difference in the young of different ages. Smaller specimens and a larger number from a greater variety of situations, would be necessary to exhibit this difference.

The food of the young as a whole, apparently, does not differ essentially from that of the large-mouthed species, except in the probably greater importance of the insect element,—especially Corixas, which in these twenty-four specimens amounted to fifty per cent. of the food—and the inferior importance of fishes.

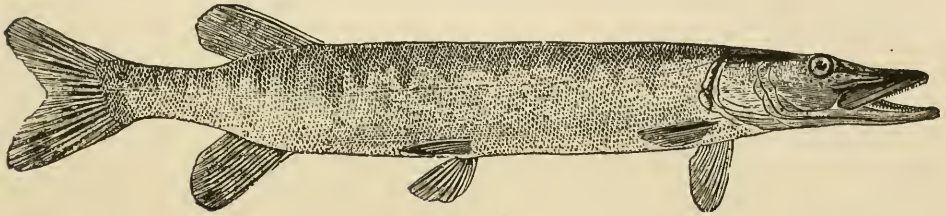
This peculiarity is expressed in a slightly different manner, in the food of the adult. The three specimens examined had eaten only fishes (*Noturus flavus* and *Percina caprodes*) and crawfishes (*Cambarus propinquus*),—thirty-eight per cent. of the former and sixty-two per cent. of the latter.

This is the first of several instances in which the ratio of fishes in the food of allied species and genera was found to correspond to the size of the mouth, being largest in those with the largest oral opening.*

TABLE OF THE FOOD OF MICROPTERUS.

	M. PALLIDUS.					M. SALMOIDES.			
	Under one inch.	One inch to two.	Two to three inches.	Three to four inches.	Adults.	One inch to two.	Two to three inches.	Three to four inches.	Adults.
Number of specimens	5	6	2	4	14	7	10	7	3
I. FISHES	.....	29	.....	.....	86	.....	05	14	38
Acanthopteri	.....	.....	.....	.....	15	.....	.....	.....	13
Percina	.....	.....	.....	.....	08	.....	.....	.....	.....
Dorysoma	.....	.....	.....	.....	58	.....	.....	.....	.....
Cyprinidæ	.....	.....	.....	.....	06	.....	05	.....	.....
Campostoma	.....	.....	.....	.....	06	.....	.....	.....	.....
Siluridæ	.....	.....	.....	.....	07	.....	.....	.....	.....
Noturus flavus	.....	.....	.....	.....	.....	.....	.....	.....	25
II. INSECTS	.....	46	100	100	+	95	89	07	.....
Undetermined larvæ	.....	.....	50	.....	.....	.....	.....	.....	.....
1. *Diptera* (larvæ)	.....	02	.....	.....	.....	04	05	.....	.....
Culicidæ	.....	.....	.....	.....	.....	.....	01	.....	.....
Chironomus	.....	02	.....	.....	.....	04	.....	.....	.....
Muscidæ	.....	.....	.....	.....	.....	.....	04	.....	.....
2. *Coleoptera* (larvæ)	.....	.....	.....	.....	.....	.....	02	.....	.....
Dytiscidæ	.....	.....	.....	.....	.....	.....	02	.....	.....
Hydrophilidæ	.....	.....	.....	.....	.....	.....	+	.....	.....

*The frequency with which these two species of black bass are confounded makes it desirable that a single reliable character should be selected by which they can be invariably distinguished, whatever the age of the specimen. This character is afforded by the size of the scales, the small-mouthed species having the smaller scales. In this species there are eleven longitudinal rows of scales between the dorsal fin and the row of perforated scales running along the middle of the side, called the lateral line. In the large-mouthed species, there are never more than nine such rows. The young are easily distinguished by the longitudinal black stripe along the side of the large-mouthed bass, which is wanting in the young of the other species.



PIKE.

Food of Micropterus—Continued.

	M. pallidus.					M. salmoides.			
	Under one inch.	One inch to two	Two to three inches.	Three to four inches.	Adults	One inch to two	Two to three inches.	Three to four inches.	Adults
3. *Hemiptera*		41	50	57	†	51	82	03	
Zaitha					†				
Corixa		42	50	57		51	82	03	
Notonecta		02							
4. *Neuroptera* (larvæ)				43	†	39	†	04	
Ephemeridæ				43		28	†		
Agrionidæ					†	11		04	
III. Crustacea	100	25		†	07	05	04	79	62
1. *Decapoda*					07				62
Cambarus					07				62
2. *Amphipoda*	07							65	
Gammarus								02	
Allorchestes								63	
3. *Isopoda* (Asellus)								14	
4. *Entomostraca*	93	25				05			
Cladocera	87	14		†		05	04		
Daphniidæ	26	12		†		05	04		
Simocephalus	18	06							
Bosmina	60								
Leptodora		02							
Copepoda (Cyclops)	06	11				†	†		
IV. Vegetation							02		
Endogenous							02		
Algæ					†		†		
Miscellaneous					07				

Ambloplites rupestris, Raf. Rock Bass.

This favorite and widely distributed species does not differ from the other fishes mentioned in respect to the food of the young. The smallest specimen examined, five-eighths of an inch long, contained only a few Cladocera (Pleuroxus). Another, three-fourths of an inch long, had eaten daphnids (seventy-five per cent.), Cyclops (ten per cent.), and larvæ of Chironomus. A third, seven-eighths of an inch long, contained only minute fragments of a few larvæ of Neuroptera. These specimens were all taken from Fox River, in July, 1879. The remaining young of the year were living chiefly on Corixa (eighty-three per cent.), as were also the young of the year preceding (ninety per cent.), as far as could be judged from the food of two specimens, from three to four inches in length. Some land insects, ephemerids, water beetles, and a few Allorchestes were also found in the food.

Four adult specimens, taken at Ottawa, on the 8th of July, had eaten some minute fishes (fifteen per cent.), a few water beetles, including *Tropisternus limbatus*, over forty per cent. of Neuroptera larvæ, and about thirty per cent. of small crawfishes. The Neurop-

tera included Baëtis and other ephemerids (twenty per cent.), Agrionidæ and large Libellulidæ, and fifteen per cent. of case-flies (Phryganeidæ.) Pond-weed (Potamogeton) found in two stomachs, had probably been taken accidentally.

Chænobryttus gulosus, C. & V. Wide-mouthed Sunfish.

This fine species is among the commonest of the family in the lakes and ponds of Southern Illinois, where it is commonly known as the "Goggle Eye."

The northern limit of its range, as far as known, is the Illinois River valley. In numbers and habitat it replaces in the South the *Eupomotis aureus* of the north; but this equivalence is only apparent, as the two species differ widely in food. From its size and abundance, it is no insignificant food resource.

Food of the Young.

My smallest specimens were from lakes in the Mississippi bottom, near Bird's Point, Missouri. Two of these, one inch long and under, taken in September, 1879, had eaten only *Bosmina longirostris* and Cyclops. Insect food first appears in specimens one and a half inches long. Eight specimens, between one and three inches long, six of which were taken from a lake in the Illinois bottoms, near Pekin, in October, 1879, and two from a lake in Kentucky, near Cairo, Illinois, had eaten about forty per cent. Entomostraca, thirty per cent. Neuroptera larvæ, and thirty per cent, Corixas and Diptera larvæ. *Daphnia pulex*, *Simocephalus americanus*, *Bosmina longirostris*, Chydorus, Pleuroxus and Cyclops, were among the Entomostraca. *Corixa alternata* was found among the Hemiptera. Most of the Diptera (i. e. fifteen per cent.) were larval Chironomus.

Food of the Adults.

Six adults, from rivers, streams and lakes in Central and Southern Illinois, show the usual change in food, carried farther than in the preceding species. Entomostraca disappear—except a few Chydorus in a single specimen—and fishes become the principal reliance, amounting to forty-seven per cent. of the food. Corixas, larvæ of *Palingenia bilineata*, and some terrestrial Coleoptera—*Anomala binotata*—which made half the food of one specimen, are the remaining items.

The especially piscivorous habit of this species is probably related to the size of its mouth, which is much the larger among the sunfishes proper. A similar relation has already been noticed between the two black bass.

TABLE OF FOOD OF AMBLOPLITES AND CHENOBRYTTUS.

	AMBLOPLITES.				CHENOBRYTTUS.			
	Under one inch	One inch to two	Three to four inches.	Adults	One inch and under	One inch to two	Two to three inches.	Adults
Number of specimens examined	3	3	2	4	2	4	4	6
I. FISHES				15				47
II. INSECTS	39	99	97	52		57	64	53
Undetermined larvæ		16		01				
Caterpillars		17						
1. *Diptera* (larvæ)	05	03		06		32	04	
Chironomus	05	03				26	04	
2. *Coleoptera*			02	03				10
Terrestrial			01					10
Aquatic								
Dytiscidæ			01	01				
Hydrophilidæ				02				
3. *Hemiptera*		63	95				20	18
Corixa		63	90				20	18
Hygrotrechus (yg.)			05					
4. *Neuroptera* (larvæ)	34			42		25	40	25
Ephemeridæ				21		03	12	25
Palingenia								25
Baëtis				01				
Agrionidæ				01		10	28	
Libellulidæ				05				
Phryganeidæ				15				
III. ARACHNIDA (Hydrachna)				+				
IV. CRUSTACEA	61		03	31	100	43	34	†
Decapoda (Cambarus)				31				
Amphipoda			03					
Entomostraca	61	01			100	43	31	†
Cladocera	58				70	24	34	†
Daphnia							21	
Bosmina					70			
Pleuroxus	33					†		
Chydorus							†	†
Copepoda	03	01			30	19		
V. VEGETATION				02			02	
Potamogeton				02			02	

APOMOTIS CYANELLUS, Raf. BLUE-SPOTTED SUNFISH.

This species, distributed throughout the State, is especially abundant in Central Illinois, where it is the common fish of the ponds and smaller streams—"the sunfish" of the country school-boy and the picnic party. It is the constant companion of the "bull-head" (Amiurus) and "shiner" (Notemigonus) in the small stagnant ponds of the prairie regions, and of the "chub minnow" (Semotilus) in muddy creeks. It was found abundant with Centrarchus, Aphredoderus and *Amiurus catus*, in the rapidly drying mud-holes,* only a few feet across, left by the retreating overflow of the Mississippi bottoms, in Union county.

* All the specimens taken from these holes, so muddy that the water was almost opaque, were of a peculiarly bleached appearance,—many of them almost colorless,—a fact of interest relative to the laws of coloration among fishes.

Food of the Young.

The smallest of nineteen specimens studied, was one inch in length—taken in July, in a prairie pond near Normal. Ninety-five per cent. of its food was Cyclops and three per cent. daphnids. The trifling remainder consisted of a Corixa just hatched, and a Chironomus larva.

Nine specimens, ranging from one to two and a fourth inches in length, vary so little in food that it is not worth while to treat them separately. These were taken from various ponds, streams and lakes of Central Illinois. Their food was distributed quite generally through the various orders of insects and crustaceans accessible to them, showing the indifferent appetite of this fish and the general effectiveness of its collecting apparatus.

Larvæ of Chironomus, Dytiscidæ, Staphylinidæ, Corixas, ephemerid larvæ, Decapoda, Isopoda, Cladocera, cyprids and Copepoda were all found in considerable quantities in the food of these specimens. As usual, the most important insects were Corixas and May-flies,—sixteen per cent. of the former and twenty-nine per cent. of the latter. About eight per cent. of the food was Cladocera (Daphnia, Simocephalus, Pleuroxus, Chydorus).

Food of the Adult.

The eight adults, from Northern and Southern Illinois, differed from the young in the disappearance of Entomostraca from the food, the larger size of the insects taken, and the appearance of fishes and crawfishes.

Among the insects were a large Hydrophilus unknown to me, but nearly as large as *H. triangularis*, the larva of *Corydalis cornutus*, of Libellula and of some ephemerid. The fishes composed about thirty-six per cent. of the food. The only recognizable specimens were a small cyprinoid and a young buffalo-fish (*Ichthyobus bubalus*). Crawfishes and the river shrimp (Palæmonetes) had been eaten by two of the specimens.

Lepiopomus pallidus, Mit. Common Sunfish.

This abundant, hardy and voracious species is found throughout the State, and may be regarded as the typical sunfish. It is most plentiful in the larger rivers in Central Illinois, being replaced in ponds by *Apomotis cyanellus*.

Consistently with its wide range and varied habitat, it is a general feeder for a sunfish,—peculiar only in the fact of its strictly non-predaceous character. Of forty-five specimens examined, only one had eaten a fish, and that one only a single small darter.

Undifferentiated Centrarchidæ.—I introduce here the food of six specimens of this family which were too small for determination. They were too deep for Micropterus, and as they had but three anal spines, could not have been Ambloplites or Pomoxys. They

were probably *Lepiopomus pallidus*. All were taken from the Illinois River.—a part of them near LaSalle, in July, 1879,—the others from Peoria, in June, 1878.

The smallest (seven-sixteenths of an inch long) had eaten only Daphniidæ. The next in size (one-half inch) contained Cyclops (ninety-eight per cent.) and Chydorus. Nearly the whole of the food of the remaining four was Daphniidæ (ninety-four per cent.), including *Daphnia pulex*.

Food of the Young.

My smallest specimens, five in number, ranging from three-fourths of an inch to one inch, were taken in August, September and October, at Pekin, Peoria and Mackinaw Creek, Woodford county. Neither locality nor date seems to have made any marked difference in their food, the principal elements of which were Entomostraca and Chironomus larvæ,—fifty-seven per cent. and thirty-seven per cent. respectively.

A few water-spiders (Hydrachnidæ) and undetermined Amphipoda were the other items. The Entomostraca were all Cyclops (twenty per cent.) and Cladocera (*Simocephalus vetulus* and *americanus*, *Bosmina longirostris* and *Pleuroxus dentatus*.)

Nine specimens, between two and three inches long, were caught at the same times and places as the preceding, except that one specimen from Mackinaw Creek was taken in June, and one taken in September was from Clear Lake, Kentucky. The greater size of these specimens was indicated by the appearance of a few Neuroptera larvæ in the food—eight per cent. In other essential respects, the food was like that of the foregoing group. One specimen had eaten largely of water mites and another of cyprids (fifty per cent.), and these elements have therefore greater prominence in the averages. Chironomus larvæ and Entomostraca now sum up eighty-one per cent.

In the third group of the young, consisting of seven fishes, between two and three inches long, the Chironomus larvæ remain about as before (thirty per cent.), Corixas appear (twenty-five per cent.) and Neuroptera larvæ rise to fourteen per cent. Entomostraca now fall away to a trifle, and larger percentages of Amphipoda appear. Single fishes had eaten the larvæ of a gyrinid beetle, portions of the polyzoan, *Pectinatella magnifica*,* Leidy, and an earthworm,—the latter probably nibbled from some fisherman's hook.

These specimens were all from the Illinois River, in June, July, October and November.

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*This animal forms the large, translucent masses found in midsummer in the slow water along the margins of the Illinois River and elsewhere throughout the State, usually collected about a stick or a stem of a water-weed. They vary from the size of a walnut to that of half a bushel. The fragments were easily recognized by the peculiar form and armature of the winter eggs (statoblasts), which are discoidal and bordered with a row of slender double hooks, shaped something like an anchor.

Food of the Adult.

The twenty-four adults examined were from various parts of the State north of the center; and, as the food has been found to differ so widely according to the local situation, I have treated them in three groups,—the first including those taken in the clear, inland, northern lakes; the second those from Calumet River, at South Chicago, and the shallow, muddy lakes of that vicinity, and the third those from the Illinois river, from Ottawa to Peoria.

The specimens from the northern lakes were taken in May and June. Sixty-two per cent. of the food consisted of Neuroptera,—eight per cent. being a black caddis-fly (*Sialis infamata*) and the remainder the larvæ of large dragon-flies (Libellulidæ), Agrions (eleven per cent.) and Baëtis (two per cent.). *Allorchestes dentata* was the next most important element (twenty-seven per cent.). A number of terrestrial insects besides Sialis appeared in the food. These included a harpalid beetle, an *Aphodius fimetarius*, and some grasshoppers (Tettigidæ, etc.).

The second group, of four, from Calumet River, and from Lake George, Indiana, was peculiar in the number of tetradecapod Crustacea and case-worms taken, and especially in the amount of vegetation eaten.

The crustacea were Allorchestes (thirty-two per cent.) and Aselus (twenty per cent.). The vegetation was present in such quantities as to make it evident that it had been taken as food. It amounted to about a fourth of the contents of these stomachs. The stomach of one fish was packed with a piece of the stem of a plant (apparently a Scirpus) a third of an inch in diameter and six inches long. Three others contained smaller amounts of confervoid Algæ.

The fifteen specimens remaining were taken from the Illinois in May, July, August, October and November. Their food was especially noticeable for the presence of mollusks (sixteen per cent.), for the number and variety of land insects (fifteen per cent.), and for the large amount of vegetation it contained (thirty-one per cent.). A single small fish,—the only one taken by these forty-five specimens—was also noted.

The mollusks included planorbis, Physa, Amnicola and Vivipara. Among the insects were ants, caterpillars, flies, *Anisodactylus discoidens* and other harpalids, *Aphodius inquinatus*, wire-worms, minute Curculios, *Cryptocephalus 4-maculatus*, *Diabrotica 12-guttata*, Colorado potato beetles, flea beetles, plant bugs (Cydnidæ), crickets (Nemobius), locusts and katy-dids (*Phaneroptera curvicauda*), grasshoppers and caseflies.

The vegetable food, as far as determined, consisted of Ceratophyllum, *Nais flexilis* and confervoid Algæ. Fragments of Polyzoa were noticed. *Coptotomus interrogatus*, gyrinid larvæ,* *Tropisternus limbatus* and other Hydrophilidæ, larval and adult, a large Nepa, larvæ of *Palingenia bilineata* and other May-flies, of Agrions and dragon-flies were among the aquatic insects taken.

*Several of these little-known larvæ were found in the stomachs of this species,—some of them in suitable condition for description.

The crustacea were limited to small crawfishes (two per cent.), a trace of Allorchestes, and a few Aselli (four per cent.).

On comparing specimens from Northern Illinois with those taken from the Illinois River in the same month, I find that there are no common seasonal food characters, and that the differences of food are therefore due to difference of locality and not to difference of time represented by the groups. Concerning the entire number of adults, we can therefore say that their food ranges through the whole list of the smaller mollusks, terrestrial and aquatic insects, and smaller crustaceans (above Entomostraca) accessible in their localities, and that they feed largely on aquatic vegetation. A striking negative feature is the almost total absence of fishes in the food,—a fact which corresponds with the relatively small size of the mouth.

TABLE OF FOOD OF APOMOTIS AND LEPIOPOMUS.

	APOMOTIS.			LEPIOPOMUS.						
	One inch long.	One to four inches.	Adults.	One inch and under.	One inch to two inches.	Two to three inches.	Northern lakes.	Calumet river and lakes.	Illinois river.	Total adults.
Number of specimens	1	10	8	5	9	7	5	4	15	24
I. FISHES	....	....	36	....	....	....	....	....	01	01
Undetermined	....	....	10	....	....	....	....	....	....	....
Etheostomatidæ	....	....	....	....	....	....	....	....	01	....
Cyprinidæ	....	....	13	....	....	....	....	....	....	....
Ichthyobus	....	....	13	....	....	....	....	....	....	....
II. MOLLUSKS	....	....	....	....	....	....	....	....	16	10
1. *Gasteropoda*	....	....	....	....	....	....	....	....	16	10
Undetermined	....	....	....	....	....	....	....	....	04	....
Planorbis	....	....	....	....	....	....	....	....	+	....
Physa	....	....	....	....	....	....	....	....	05	....
Vivipara	....	....	....	....	....	....	....	+	07	....
Amnicola	....	....	....	....	....	....	....	....	+	+
2. *Acephala*	....	....	....	....	....	....	....	....	+	....
III. INSECTA	02	79	42	37	34	72	70	23	43	45
Undetermined	....	12	01	....	....	02	....	....	....	....
Terrestrial	....	07	....	....	....	....	05	01	15	12
Aquatic	02	60	41	37	34	70	65	22	28	33
1. *Diptera* (Chironomus)	01	09	....	37	26	39	....	+	01	01
2. *Coleoptera*	....	02	05	....	....	01	01	01	09	06
Undetermined	....	....	....	....	....	....	....	+	04	....
Dytiscidæ	....	02	....	....	....	....	....	....	02	....
Undetermined	....	02	....	....	....	....	....	....	....	....
Larvæ	....	....	....	....	....	....	....	....	01	....
Coptotomus	....	....	....	....	....	....	....	....	01	....
Gyrinidæ	....	....	....	....	....	01	....	01	01	....
Hydrophilidæ	....	....	....	....	....	....	01	....	02	....
Undetermined	....	....	05	....	....	....	....	....	01	....
Tropisternus	....	....	....	....	....	....	....	....	01	....
3. *Hemoptera*	01	16	03	+	....	25	02	01	04	02
Undetermined	....	....	....	+	....	....	....	....	....	....
Corixa	01	16	03	....	....	25	01	....	04	....
Nepa	....	....	....	....	....	....	01	....	....	....
Ranatra	....	....	....	....	....	....	....	01	....	....
4. *Neuroptera*	....	33	33	....	08	14	62	20	14	24
Larvæ (undetermined)	....	....	....	....	01	....	....	....	....	....
Ephemeridæ (larvæ)	....	29	27	....	07	....	02	....	05	03
Baëtis	....	....	....	....	....	....	02	....	....	....
Palingenia	....	....	01	....	....	....	....	....	04	02
Agrionidæ (larvæ)	....	....	06	....	....	14	11	....	+	02
Libellulidæ (larvæ)	....	04	02	....	....	....	41	....	02	10
Sialidæ	....	....	04	....	....	....	08	....	07	06
Sialis	....	....	....	....	....	....	03	....	07	....
Corydalis (larvæ)	....	....	....	....	....	....	....	....	....	....
Phryganeidæ	....	....	....	....	....	....	....	20	....	03

Table of Food of Apomotis and Lepiopomus—Continued.

	Apomotis.			Lepipomus.						
	One inch long.	One to four inches.	Adults.	One inch and under.	One to two inches.	Two to three inches.	Northern lakes.	Calumet river and lakes.	Illinois river.	Total adults.
IV. Arachnida	....	....	...	04	11	01	01	...	....	....
Spiders	....	....	....	....	....	....	01	†	....	....
Hydrachnidæ	....	....	....	04	11	01	....	....	†	....
V. Crustacea	98	21	20	59	55	06	27	52	06	18
Decapoda	....	01	20	....	....	....	....	....	02	01
Undetermined	....	01	....	....	....	....	....	....	....	....
Cambarus	....	....	08	....	....	....	....	....	02	....
Palæmonetes	....	....	12	....	....	....	....	....	....	....
Amphipoda	....	....	....	02	....	05	27	32	....	11
Undetermined	....	....	....	02	....	....	....	....	....	....
Allorchestes	....	....	....	....	....	05	27	32	†	....
Isopoda (*Asellus*)	....	04	....	....	....	....	....	20	04	06
Entomostraca	98	16	....	57	55	01	....	†	....	....
Cladocera	....	08	....	37	14	....	....	†	....	....
Daphniidæ	03	07	....	33	12	....	....	....	....	....
Lynceidæ	....	01	....	04	02	01	....	†	....	....
Ostracoda	....	03	....	....	06	....	....	†	†	....
Copepoda	95	05	....	20	35	†	....	....	....	....
VI. Vermes	....	....	....	....	....	20	....	....	03	02
Undetermined	....	....	....	....	....	†	....	....	....	....
Polyzoa	....	....	....	....	....	11	....	....	03	02
Lumbriens	....	....	....	....	....	09	....	....	....	....
VII. Vegetation	....	....	02	....	....	01	02	25	31	24
Phænogamous	....	....	02	....	....	01	02	21	19	16
Algæ	....	....	....	....	....	...	....	04	12	08

Xenotis megalotis, Raf. Long-eared Sun-fish.

This little species is not at all common in the State, but has been taken by us from the middle course of Fox R., from tributaries of the Illinois R., and from ponds in Union county, in southern Illinois.

Unfortunately, the three specimens examined had not lately taken food, and only a very imperfect notion of their usual aliment can be given. Corixa, ephemerid larvæ, Chironomus larvæ, the tube of a case-worm, a few fish-scales and an undeterminable aquatic beetle were the only objects found.

Xenotis peltastes.* Cope.

This beautiful little fish, hitherto taken in this State only in very small number from Fox R., was found quite abundant in the "slip" at South Chicago, in June, 1880. The three opened had eaten more larvæ of Chironomus than any thing else (sixty per cent.). Next came sixteen per cent. of mollusks, then Allorchestes and Asellus, Corixa, gyrinid larvæ, and a few terrestrial larvæ (Chrysomelidæ). The large percentage of Chironomus was probably owing to the situation, a foul and muddy little bay, serving as a harbor for fishing-boats.

*It is considered doubtful, by Dr. Jordan, if this species and the preceding are distinct.

Eupomotis aureus, Wahl. Pumpkin Seed. Bream.

This species swarms in the lakes and ponds of northeastern Illinois, but is much less abundant in the Illinois R.; and in the southern part of the State is almost unknown. The cause of this limitation of its range is apparently climatic; as there is certainly nothing in its food, nor, apparently, in any of its habits, to exclude it from our southern waters. Indeed, I do not see that its place is taken by any other fish to the southward. No other, unless *Eupomotis pallidus*, resembles it in food, and this is too infrequent to replace it. My knowledge of its food is based upon the study of twenty-five specimens, ranging from one and one-half inches upward, taken from the Illinois, Fox and Calumet rivers, and from Long, Crystal and Nipisink lakes and Lake George, in central and northern Illinois and Indiana. The months of May, June, July, August and October are represented by these specimens.

Food of the Young.

The nine smaller specimens, from one and one-half to two inches long, show at once two prominent peculiarities of the food. The larvæ of Chironomus compose fifty-one per cent. of the food, and Entomostraca of the order Ostracoda (cyprids), twenty-six. As both these are found most abundantly in muddy bottoms, it is evident that the fish is, at least at first, a bottom feeder. Traces of mollusks appear thus early, as well as a few ephemerid larvæ (five per cent.). The remainder of the food was insects' eggs and daphnids, —chiefly *Simocephalus americanus*—(twelve per cent.). Chydorus was found in five specimens, but in too small quantity to figure in the averages.

Five specimens were studied, between two and three inches long. In these the same food characters continue, modified somewhat by the introduction of larger objects. The Chironomus larvæ stand at forty-four per cent., and the cyprids at eighteen per cent. Fourteen per cent. of Allorchestes and eleven per cent. of Neuroptera larvæ are the only important elements remaining. Two per cent. of young Unios were noticed. Nearly half of the food of two larger specimens, between two and three inches long, consisted of mollusks,—chiefly Physa. A few Chironomi and about equal quantities of ephemerid larvæ and Allorchestes were all the remaining food. Entomostraca therefore disappear at this point.

Food of the Adult.

Forty-six per cent. of the food of the nine adults consisted of Mollusca, including Planorbis, Amnicola and *Valvata tricarinata*, and six per cent. of undetermined bivalves.

The insect food was twenty per cent. of the whole. Crustacea twenty-two per cent., and vegetation twelve per cent. Half of the last was Chara, and the remainder chiefly Myriophyllum and Algæ. The Crustacea were all Allorchestes and Asellus. The insects included a trace of Chironomus larvæ and a few water beetles (Hydrophilidæ), and the usual Neuroptera larvæ, among which case-flies of the genus Leptocerus were noticed.

Not a trace of fishes was found in the stomachs of these specimens; and this fact, together with the large percentage of molluscan food, constituted the leading alimentary peculiarities of the species.

The first of these is doubtless related to the small mouth,—the second to the stout, blunt pharyngeal teeth,—a character used in defining the genus. In all the preceding species the pharyngeals are set with more slender, pointed teeth.

Eupomotis pallidus, Ag. Pale Sun-fish.

Having but few specimens of this rather uncommon species, I have examined the food of but one,—enough to indicate that it probably agrees closely with the preceding species.

This fish, taken in Clear Lake, Ky., had eaten largely of small Mollusca,—young Unionidæ, Planorbis, Amnicola, etc. These amounted to seventy-five per cent. of the food. The remaining elements were Chironomus larvæ, several small water beetles. (*Hydroporus hybridus, Cnemidotus* 12-*punctatus*, and *Haliplus*, sp.), an unknown aquatic pupa and a little pond-weed.

Table of Food of Eupomotis and Centrarchus.

	Eupomotis.				Centrarchus.		
	One inch to two.	Two to three inches.	Three to four inches.	Adults.	One inch and under.	One inch to two.	Adults.
Number of specimens examined	9	5	2	9	5	1	2
I. Mollusca	01	04	45	46	.....	.....	.....
Undetermined	.....	.....	.....	07	.....	.....	.....
Gasteropoda	01	02	45	33	.....	.....	.....
Amnicola	.....	.....	.....	04	.....	.....	.....
Vivipara	.....	.....	.....	11	.....	.....	.....
Planorbis	.....	.....	.....	01	.....	.....	.....
Physa	.....	.....	40	.....	.....	.....	.....
Acephala	.....	02	.....	06	.....	.....	.....
II. Insecta	60	61	30	20	24	20	91
Undetermined	03	03	.....	.....	.....	.....	07
1. *Diptera* (larvæ)	52	45	05	01	21	.....	06
Chironomus	51	44	05	01	21	.....	06
2. *Coleoptera*	.....	02	.....	02	.....	.....	.....
Hydrophilidæ	.....	02	.....	02	.....	.....	.....
3. *Hemiptera*	.....	.....	.....	.....	.....	20	23
Corixa	.....	.....	.....	.....	.....	20	23
4. *Neuroptera* (larvæ)	05	11	25	17	03	.....	55
Ephemeridæ	05	05	25	03	03	.....	55
Palingenia	.....	.....	.....	03	.....	.....	.....
Agrionidæ	.....	06	.....	.....	.....	.....	.....
Libellulidæ	.....	.....	.....	08	.....	.....	.....
Phryganeidæ	.....	.....	.....	02	.....	.....	.....
III. Arachnida	.....	.....	.....	.....	01	.....	.....
Hydrachnidæ	.....	.....	.....	.....	01	.....	.....
IV. Crustacea	39	35	25	22	75	80	.....

Table of food of Eupomotis and Centrarchus—Continued.

	Eupomotis.				Centrarchus.		
	One inch to two.	Two to three inches.	Three to four inches.	Adults.	One inch and under.	One inch to two.	Adults.
Number of specimens examined	9	5	2	9	5	1	2
Amphipoda (Allorchestes)	.....	14	25	13	04	.....	.....
Isopoda (Asellus)	.....	.....	.....	09	.....	.....	.....
Entomostraca	39	21	.....	.....	71	80	.....
Cladocera	13	03	.....	.....	12	.....	.....
Simocephalus	12	01	.....	.....	12	.....	.....
Ostracoda	26	18	.....	.....	21	35	.....
Copepoda	.....	.....	.....	.....	38	45	09
V. Vegetation	.....	+	.....	12	.....	.....	.....
Myriophyllum	.....	.....	.....	04	.....	.....	.....
Chara	.....	.....	.....	06	.....	.....	.....
Algæ	.....	+	.....	02	.....	.....	.....

Centrarchus irideus, Lac.

This little species is found in considerable numbers in ponds and streams in the southern hill-country of Illinois. My specimens, all taken in July, are from ponds and streams in the Mississippi bottoms in Union and Jackson counties, and from Cache R. and its tributaries in Johnson county.

Five of the young, from three-fourths of an inch to an inch in length, had eaten seventy-one per cent. of Entomostraca and twenty-one per cent. of larvæ of Chironomus; and, for the rest, about equal quantities of ephemerid larvæ and young Allorchestes, with a trace of water mites (Hydrachnidæ).

Thirty-eight per cent of the food was Cyclops; cyprids amounted to twenty-one per cent,; and twelve per cent. of Simocephalus completed the ratio of Entomostraca. The smallest specimen, three-fourths of an inch long, had eaten sixty per cent. Simocephalus and forty per cent. Cyclops.

About a fifth of the food of one specimen, an inch and an eighth in length, consisted of minute young Corixas, the remainder being about equally Cyclops and cyprids.

Only two specimens were examined which could be classed as adults,—one three and a fourth inches long, the other smaller. These indicate that the food of full-grown individuals differs from that of the young chiefly in the addition of considerable quantities of terrestrial and aquatic insects.

The gill-rakers of this species are numerous, long and slender—a fact reflected in the food. Fifteen per cent. of the contents of the

stomach of the largest specimen consisted of Cyclops, and five per cent. of Chironomus larvæ. Consistently with the small mouth and pointed pharyngeal teeth, no traces of fishes or mollusks were found in the food.

Pomoxys nigromaculatus, Lac. Black Croppie. Lake Croppie. Silver Bass. Butter Bass.

Pomoxys annularis, Raf. White Croppie. Timber Croppie. Silver Bass.

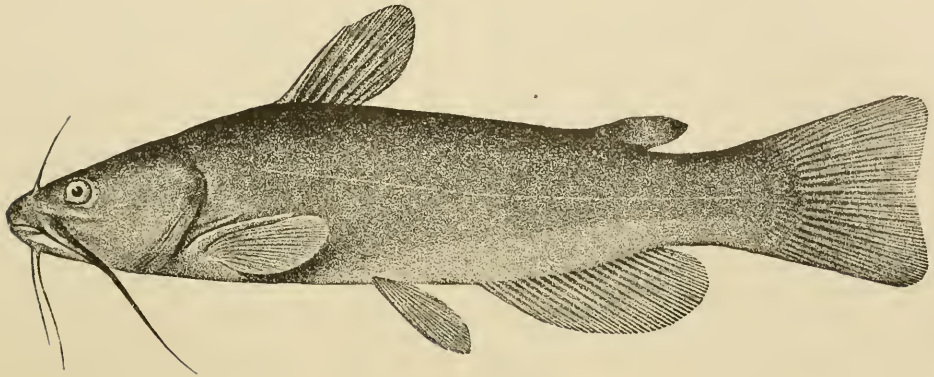
These two species, often not distinguished even by experienced fishermen, agree so closely in food that I have not thought it worth while to treat them separately. In the Illinois and Mississippi Rivers they are much the most valuable and important of the family, excepting the black bass. They are nowhere else so abundant in the State, although occurring in the larger rivers generally and in the great lakes. The first species is commonest to the north, and the second southward, as far as my observation goes. In the Illinois, they are about equally abundant. These fishes are everywhere great favorites, and rank among the most important and promising of our smaller species. They are rarely found in creeks or small ponds, but seem to require deeper water for their maintenance.

The gill-rakers of this species are numerous, long and finely-toothed, constituting the most efficient straining apparatus to be found among the sun-fishes. The pharyngeal teeth are sharp, and the mouth is rather wide and considerably enlarged by the lengthening of the lower jaw.

Consistently with the hypothesis concerning the meaning of the gill-rakers which I had already formed from a study of the preceding species, before I came to this, I found that the young continued to feed almost exclusively upon Entomostraca much longer than the other sun-fishes. Six specimens between three and four inches long, had eaten little else than Entomostraca and the larvæ of minute Diptera (Chironomus and Corethra). Even full-grown specimens were found eating Cladocera more freely than any other food. As might be inferred from the pharyngeals, not a trace of molluscan food was found in the forty-two specimens examined, while fishes formed nine per cent. of the food of the twenty-seven adults. Most of these were eaten late in the season, when Entomostraca and insect larvæ became less abundant.

Food of the Young.

The smallest specimen, three-fourths of an inch long, had eaten about equal quantities of Cyclops and Simocephalus, with only a few Pleuroxus beside. Three, an inch long and under, had confined their food entirely to Entomostraca and Chironomus larvæ,—the latter forming about a fourth of the whole. A third of the Entomostraca were Cyclops, the remainder chiefly Simocephalus.



BULL HEAD.

Six specimens between one and three inches long, differed especially in the introduction of about eighteen per cent. of Corixas and three per cent. of small ephemerid larvæ. Chironomus larvæ were reduced to seven per cent. The Entomostraca were about equally divided between Cyclops and Cladocera. One specimen taken in July, 1879, from the canal near Ottawa, had taken a large number of Daphnella.

Six specimens between three and four inches long were examined. Eighty-three per cent. of their food was Entomostraca, about three-fourths of this amount being Cyclops, and the remainder nearly all Simocephalus. Twelve per cent. of larvæ of Chironomus and Corethra, three per cent. Corixas and two per cent. larvæ of small ephemerids were the insect elements. Chydorus, Pleuroxus and Cypris were present in small numbers.

These fifteen young, agreeing so closely in food, irrespective of size, were nevertheless from a variety of situations and dates. All were from the Illinois River, its lakes and tributaries, from Ottawa to Pekin, but ranged in time from June to October in three different years.

Six were *P. nigromaculatus*, seven were *P. annularis*, and two were not identified specifically.

Food of the Adults.

An examination of the notes on the twenty-seven adults shows material differences of food at different parts of the year. As all but one were taken from the Illinois River, I have not the means of noting the correspondence of food with locality.

Five specimens taken at Peoria, in March, were found feeding most freely upon Cladocera, which composed fifty-five per cent. of their food. These were chiefly of the two species *Simocephalus vetulus* and *S. americanus*. These little Entomostraca were taken at that time in such quantity as visibly to distend the stomach when seen from the outside, and the immense numbers of their eggs gave a reddish color to the contents of the alimentary canal. The larvæ of Neuroptera, both "darning-needles" and May-flies (Palingenia), were also eaten in considerable numbers (thirty-nine per cent.). A small Hybopsis, a little darter (*Boleosoma maculatum*) and an unrecognizable fish were found in these stomachs, making about six per cent. of the food. Only trivial numbers of Entomostraca appear after this time.

Nine specimens, taken in April, likewise at Peoria, were feeding chiefly upon Neuroptera larvæ (eighty-six per cent.), especially upon that almost invaluable element of fish food, the larvæ of *Palingenia bilineata* (sixty-six per cent.). A few larvæ of Gyrinidæ and Dytiscidæ were noted (three per cent.), and a few Corixas also. A *Gammarus fasciatus* and a little Ceratophyllum, etc., were noticed; and also the flower of an elm and the feather of a bird.

A single specimen from Pistakee lake, in McHenry county, taken in May, gave evidence of a similar reliance upon neuropterous larvæ (eighty-five per cent.) Here, however, in the absence of

Palingenia, Agrions and the larger dragon-flies were resorted to. A little vegetation had been taken with these (*Ceratophyllum demersum* and *Lemna trisulca*, ten per cent.) probably by accident, as this lake was full of aquatic plants, and it would hardly have been possible for a fish to catch living food from the water without getting more or less vegetation at the same time. A single hymenopter,—the only land insect found eaten by this species,—was taken from this stomach. A specimen taken in June at Peoria had eaten about equally of minute unrecognized fish-fry and Palingenia larvæ. One caught at Ottawa in July had eaten only insects,—Corixa twenty-five per cent., Palingenia larvæ seventy-five per cent.

Five croppies from Peoria, in October, 1878, and five from Henry, thirty miles above, in November, 1877, indicate that the autumnal food of the species is again different. These had eaten, respectively, thirty-nine per cent. of small fishes,—partly Cyprinidæ and partly undetermined Acanthopteri. The remainder of their food was composed chiefly of Palingenia larvæ. One October specimen had eaten two larvæ of the large "Hellgrammite," *Corydalis cornutus*. Although these fishes were taken directly from the seine, and opened upon the spot, the food in their stomachs did not average more than a fourth of the quantity in those taken in early spring. The weather during both these months was uncomfortably cold, with falling snow, and the food of these specimens probably gives a correct hint of the winter food of the species.

Fourteen of the above were *Pomoxys nigromaculatus* and twelve *P. annularis*,—one not having been determined.

TABLE OF FOOD OF POMOXYS.

	One inch and under	One inch to three	Three to four inches	March, Peoria	April, Peoria	May, Pistakee Lake	June, Peoria	July, Ottawa	October, Peoria	November, Henry	Total adults
No. of specimens	3	6	6	5	9	1	1	1	5	5	27
I. Fishes				06			50		39	28	15
Acanthopteri									10	08	03
Boleosoma				01							
Cycloid				04					11		
Cyprinidæ				04					11		03
Hybopsis				04							01
II. Insects	28	28	17	39	90	90	50	100	61	72	73
1. *Hymenoptera*						05					
2. *Diptera* (larvæ)	28	07	12						01	02	01
Corethra		+	03						01		
Chironomus	28	07	09		†	†				02	
3. *Coleoptera* (larvæ)					03	†				03	01
Gyrinidæ					02					03	
Dytiscidæ					01						
4. *Hemiptera*		18	03		01			25			01
Corixa		18	03		01	†		25			01
5. *Neuroptera* (larvæ)		03	02	39	86	85	50	75	60	67	68
Ephemeridæ		03	02	15	72				44		54
Palingenia				15	66		50	75	44	67	52
Agrionidæ				24	14	55					12
Libellulidæ						30					01
Sialidæ (Corydalis)									16		01

Table of Food of Pomoxys—Continued.

	One inch and under	One inch to three...	Three to four inches	March, Peoria.....	April, Peoria	May, Pistakee Lake	June, Peoria.....	July, Ottawa.....	October, Peoria.....	November, Henry ..	Total adults. .....
No of specimens.....	3	6	6	5	9	1	1	1	5	5	27
III. CRUSTACEA.....	72	72	83	57	10	.....	.....	.....	.....	.....	12
Gammarus.	.....	.....	.....	.....	†	.....	.....	.....	.....	.....	.....
Entomostraca.....	72	72	83	55	10	.....	.....	.....	.....	.....	12
Cladocera	49	33	17	55	10	.....	.....	.....	.....	.....	12
Daphniidæ.	46	18	17	55	†	.....	.....	.....	.....	.....	12
Lynceidæ.....	03	01	†	.....	.....	.....	.....	.....	.....	.....	.....
Sididæ.	.....	14	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ostracoda.....	.....	.....	01	†	†	.....	.....	.....	.....	.....	.....
Copepoda	23	39	65	.....	†	.....	†	.....	.....	.....	.....
IV. Vegetation.....	.....	.....	.....	†	†	10	†	†	.....	.....	.....

Summary of the Family.

For the purpose of a comparative recapitulation of the above data respecting the food of the sun-fishes, I have prepared three condensed tables, showing, upon the same page, the food of the different genera in parallel columns. The first table exhibits the food of the youngest specimens, the second, of those of intermediate size, and the third, of those which may properly be regarded as mature.

By an inspection of the first table, it will be seen that the thirty specimens, one inch long and under, representing eight genera, which appear thereon, have eaten little else than Entomostraca and larvæ of Chironomus—these two elements amounting to ninety-three per cent. of the food. The only exception to this rule (that of the rock bass) is apparent rather than real. The large percentage of neuropterous larvæ appearing under the name of that species is a technical ratio, inserted only for the sake of consistency, being based upon the fact that one of the specimens examined contained no food except a few traces of some indeterminable minute larva of that order. The minor differences in the food of the generic groups are doubtless due to differences of locality, and the like. That Ostracoda, for example, were found only in the stomachs of Centrarchus, is accounted for by the fact that the youngest specimens of this genus were taken from small mud-holes, favorable to the occurrence of Entomostraca of that order. The uniformity of food at this time implies that the selective apparatus of these fishes, whatever its construction, has not yet grown beyond the size of these minute animal forms.

From the second table of one hundred and six specimens we learn that with a general change of food from Entomostraca and Chironomus to larger Crustacea and insects, there appear certain differences—notably the continuance of Entomostraca as the most important element in Pomoxys, and the occurrence of mollusks in Eupomotis and of fishes in Micropterus. It is important to recall, at this point, that Pomoxys has the largest, finest and most numerous gill-rakers of the group—the best *straining* apparatus, in short,—that Eupomotis has stout and pharyngeal teeth, and that the black

bass have relatively the widest mouths of all. It is also to be noted that the large-mouthed bass commenced to take fish when an inch and a quarter long, and the small-mouthed species not until it reached a length of two and a half inches.

It will also be observed that Entomostraca are least abundant in the food of the small-mouthed black bass and the rock bass—species found usually in swift and shallow water, when of this size. The importance of water-bugs (Corixa) to the first three species of this table is evident.

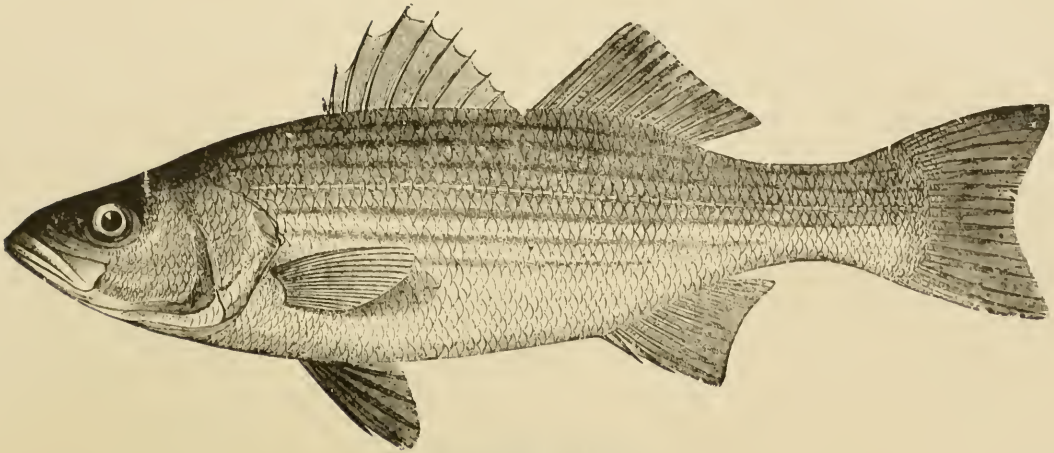
From the table of adult food we find that these commencing peculiarities of the preceding table become here more prominent. All the Entomostraca of this table, except insignificant traces, now appear in the food of Pomoxys; the molluscan food of Eupomotis is nearly five times that of any other genus; and the ratios of fish food, running from eighty-six per cent. down to nothing, when arranged in a series, are seen to correspond, with curious exactness, to a series of the species themselves arranged according to the relative sizes of their mouths.

I was disappointed in being unable to find any food characteristics corresponding to such minor differences in the lengths of the gill-rakers of the anterior arch as appear in Lepiopomus, Apomotis, etc., on the one hand, and Xenotis and Eupomotis on the other. If such peculiarities exist, they can probably be determined only by taking at one time and place a number of specimens of unlike character in this particular.

While I believe that the generalizations made above will hold good, at least for fishes of similar form and internal structure among the Acanthopteri, I do not wish to be understood as extending them at present beyond this order. Doubtless, while the characters mentioned must assist greatly in determining the food of a species *a priori*, they are not by any means sufficient for this purpose when taken by themselves. The discussion of other features, external and internal, bearing upon this subject, must be postponed to a later period of the investigation.

TABLE OF FOOD OF YOUNG CENTRARCHIDÆ. (*One inch and under.*)

	Micropterus pallidus	Micropterus salmoides	Amblopliles	Chænobryttus	Apomotis	Lepiopomus	Xenotis	Eupomotis	Centrarchus	Pomoxys	Undetermined	Total
Number of specimens	5		3	2	1	5			5	3	6	30
I. INSECTS			39		02	37			24	28		17
1. *Diptera* (larvæ)			05		01	37			21	28		13
Chironomus			05		01	37			21	28		13
2. *Hemiptera*					01							
Corixa (young)					01							
3. *Neuroptera* (larvæ)			34						03			04
II. ARACHNIDA (Hydrachna)						04			01			01
III. CRUSTACEA	100		61	100	98	59			75	72	100	82
Tetradecapoda	07					02			04			02
Entomostraca	93		61	100	98	57			71	72	100	80
Cladocera	87		58	70	03	37			12	49	88	53
Ostracoda									21		+	04
Copepoda	06		03	30	95	20			38	23	22	23



STRIPED BASS.

Table of Food of Young Centrarchidæ. (*One to four inches.*)

	Micropterus pallidus	Micropterus salmoides	Amblopliles	Chænobryttus	Apomotis	Lepiopomus	Xenotis	Eupomotis	Centrarchus	Pomoxys
Number of specimens	12	24	5	8	10	16	.....	16	3	12
I. Fishes	15	06	.....	.....	.....	.....	.....	.....	.....	.....
II. Mollusca	.....	.....	.....	.....	.....	.....	.....	08	.....	.....
III. Insecta	72	67	98	61	78	51	.....	56	67	22
1. *Diptera* (larvæ)	01	03	02	18	09	28	.....	44	04	09
Chironomus	01	01	02	15	07	28	.....	43	04	08
2. *Coleoptera*	.....	02	01	.....	09	†	.....	01	.....	.....
Terrestrial	.....	.....	.....	.....	07	.....	.....	.....	.....	.....
Aquatic	.....	02	01	.....	02	†	.....	01	.....	.....
3. *Hemiptera* (aquatic)	50	50	78	10	16	11	.....	.....	23	11
Corixa	49	50	76	10	16	11	.....	.....	23	11
4. *Neuroptera*	14	12	.....	33	33	11	.....	10	37	02
Ephemeridæ	14	08	.....	08	20	05	.....	08	37	02
Odonata	.....	04	.....	19	04	06	.....	02	.....	.....
IV. Arachnida	.....	.....	.....	.....	.....	07	.....	.....	.....	.....
V. Crustacea	13	26	02	38	22	32	.....	36	.....	78
Decapoda	.....	.....	.....	.....	01	.....	.....	.....	.....	.....
Tetradecapoda	.....	23	01	.....	04	.....	.....	08	.....	.....
Entomostraca	13	03	01	38	17	32	.....	28	33	78
Cladocera	07	03	.....	29	09	08	.....	08	.....	25
Ostracoda	.....	.....	.....	.....	03	03	.....	20	12	01
Copepoda	06	†	01	09	05	20	.....	.....	21	52
VI. Polyzoa	.....	.....	.....	.....	.....	05	.....	.....	.....	.....
VII. Lumbricus	.....	.....	.....	.....	.....	04	.....	.....	.....	.....
VII. Vegetation	.....	01	.....	01	.....	01	.....	.....	.....	.....

Table of Food of Adult Centrarchidæ.

	Micropterus pallidus	Micropterus salmoides	Amblopliles	Chænobryttus	Apomotis	Lepiopomus	Xenotis	Eupomotis	Pomoxys
No. of specimens examined	14	3	4	6	8	24	6	9	27
I. Fishes	86	38	15	46	36	01	07	.....	15
Acanthopteri	15	.....	.....	.....	.....	01	.....	.....	03
Dorysoma	58	.....	.....	.....	.....	.....	.....	.....	.....
Cyprinidæ	06	.....	.....	.....	12	.....	.....	.....	03
Siluridæ	07	.....	.....	.....	.....	.....	.....	.....	.....
II. Mollusca	.....	.....	.....	.....	.....	10	08	46	.....
Gasteropoda	.....	.....	.....	.....	.....	10	04	33	.....
Acephala	.....	.....	.....	.....	.....	†	04	06	.....
III. Insecta	†	.....	52	51	42	45	82	20	73
1. *Diptera* (larvæ)	.....	.....	06	.....	.....	01	37	01	01
Chironomus	.....	.....	.....	.....	.....	.....	37	01	.....
2. *Coleoptera*	.....	.....	03	10	05	13	06	02	01
Terrestrial	.....	.....	.....	10	.....	06	04	.....	.....
Aquatic	.....	.....	03	.....	05	.....	.....	02	01
3. *Hemiptera* (Corixa)	†	.....	.....	18	03	02	17	.....	01
4. *Orthoptera*	.....	.....	.....	.....	.....	02	.....	.....	.....
5. *Neuroptera*	†	.....	42	25	33	24	16	17	68
Ephemeridæ	.....	.....	21	25	27	03	.....	04	52

Table of Food of Adult Centrarchidæ—Continued.

	Micropterus pallidus	Micropterus salmoides	Amblopliles	Chænobryttus	Apomotis	Lepiopomus	Xenotis	Eupomotis	Pomoxys
No. of specimens examined	14	3	4	6	8	24	6	9	27
Palingenia	.....	.....	.....	25	01	02	.....	03	52
Odonata	.....	.....	06	.....	02	12	.....	08	13
Sialidæ	.....	.....	.....	.....	04	06	.....	.....	01
Phryganeidæ	.....	.....	15	.....	.....	03	08	01	.....
IV. Arachnida	.....	.....	†	.....	.....	.....	.....	.....	.....
V. Crustacea	07	62	31	†	20	18	03	22	12
Decapoda	07	62	31	.....	20	01	.....	.....	.....
Tetradecapoda	.....	.....	.....	.....	.....	17	03	22	.....
Entomostraca	.....	.....	.....	†	.....	†	.....	.....	12
Cladocera	.....	.....	.....	†	.....	†	.....	.....	12
Ostracoda	.....	.....	.....	.....	.....	†	.....	.....	†
Copepoda	.....	.....	.....	.....	.....	.....	.....	.....	†
VI. Polyzoa	.....	.....	.....	.....	.....	02	.....	.....	.....
VII. Vegetation	†	.....	02	.....	02	24	.....	12	†
Miscellaneous	07	.....	.....	.....	.....	.....	.....	.....	.....

Haploidonotus grunniens, Raf. Sheepshead. Grunting Perch.

This species is abundant in Lake Michigan and the larger rivers, occurring in the smaller streams rarely, at periods of exceptionally high water. It is sometimes eaten, but is regarded usually as unfit for food.

But six of the twenty-five specimens studied were young, and the smallest of these, from the Ohio R., in September, was an inch and an eighth in length. Seventy-five per cent. of its food was larvæ of Chironomus and twenty-five per cent. larvæ of *Palingenia bilineata*. Besides the usual indications that the food of the very young is made up of minute animals, we see here evidence that this species seeks its food from the first upon the bottom. In a specimen two inches long, the Chironomus larvæ fell to fifteen per cent., while the Palingenia larvæ rose to eighty per cent., and other ephemerids and Cyclops made up the remainder of the food.

Four specimens, also from the Ohio, at Cairo, from two to four inches long, were found to have recently fed upon ephemerid larvæ and larvæ of aquatic beetles, Gyrinidæ and Hydrophilidæ, in about equal quantities. Only five per cent. of their food was Chironomus.

Sixteen individuals of medium size were taken from the Illinois and Ohio rivers, in April, June, September and October of four different years. There was nothing in the contents of these stomachs to indicate any difference in food resulting from these differences of

date and situation. The food, on the contrary, was remarkably simple and uniform, consisting chiefly of the larvæ of Neuroptera (eighty-four per cent.), of which *Palingenia bilineata* formed altogether the most important part (seventy-six per cent.),—the remaining eight per cent. being dragon-flies. A single small sucker (Catostomidæ), a few mollusks (Planorbis, young Unios and thin-shelled Anodontas), and some Aselli complete the brief dietary of this group.

It is not until we examine the food of full-grown specimens that we wholly appreciate the utility of the enormous crushing pharyngeal jaws with their pavement teeth, found in this species. The entire food of the three large specimens examined, taken at Peoria, in April and October, proved to consist of mollusks only, including forty-six per cent. of the thick and heavy water snail, *Melantho decisa*, whose shell probably no other fish in our rivers could break. Cyclas, Anodonta and undeterminable Gasteropoda composed the remainder of the food.

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